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Occupational Outlook Handbook

1986-87 Edition

U.S. Department of Labor
Bureau of Labor Statistics
April 1986

Bulletin 2250

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Things Worth Noting

- Pointers on interpreting the information presented in the *Handbook* are found in the section **How To Get the Most From the Handbook,** page 1.
- Additional career-oriented materials, available from private and public organizations, are described in the section **Where To Go for More Information,** page 7.
- An overview of job growth through the mid-1990's is given in **Tomorrow's Jobs,** page 13.
- For some 200 occupations not covered in detail in the *Handbook*, appendix A, page 469, provides a brief description of the nature of the work, number of jobs in 1984, and the projected 1984–95 change in employment.
- The assumptions and methods used in preparing BLS employment projections are described briefly in appendix B, page 489.
- Sources of State and local job outlook information can be found in appendix C, page 492.
- **Occupational Projections and Training Data** and the **Occupational Outlook Quarterly** are publications that complement or supplement material presented in the *Handbook*. See page 523 and the inside back cover for information about these publications.
- The index beginning on page 513 lists the occupations described in the *Handbook* in alphabetical order.

Occupational Outlook Handbook

1986–87 Edition

U.S. Department of Labor
William E. Brock, Secretary

Bureau of Labor Statistics
Janet L. Norwood, Commissioner

April 1986

Bulletin 2250

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Foreword

The selection of an occupation is one of the most important decisions in a person's life. For the young jobseeker, questions abound as to what skills are required in each field and how those skills may be attained or refined. Furthermore, while jobseekers may be aware of their own interests and abilities, they face the perplexing choice of selecting a field which promises the greatest economic and personal satisfaction.

As technological advances rapidly alter the job market, it is not only the young who need current, accurate, and comprehensive career information. The choices are no easier for persons seeking a career change or for those entering the labor force at later stages in their lives. The availability of career information is vital to all jobseekers and to our Nation as a whole.

Since the late 1940's, the *Occupational Outlook Handbook* has been an invaluable primary source of vocational guidance information. In clear language, it describes what workers do in each job, the training and education they need, earnings, working conditions, and expected job prospects for selected occupations covering a wide spectrum of the economy. I am certain that the updated 1986-87 edition of the *Occupational Outlook Handbook* will provide valuable assistance to everyone seeking satisfying and productive employment.

JANET L. NORWOOD
Commissioner
Bureau of Labor Statistics

Acknowledgments

The *Handbook* was produced in the Bureau of Labor Statistics under the general guidance and direction of Neal H. Rosenthal, Chief, Division of Occupational Outlook, and Ronald E. Kutscher, Associate Commissioner for Economic Growth and Employment Projections. Michael Pilot, Manager, Occupational Outlook Program, was responsible for planning and day-to-day direction.

Project leaders supervising the research and preparation of material were Daniel E. Hecker, Anne Kahl, Chester C. Levine, and Patrick Wash. Occupational analysts who contributed material were William M. Austin, Verada P. Bluford, Douglas J. Braddock, Donald E. Clark, Conley Hall Dillon, Jr., Lawrence C. Drake, Jr., Sandy Gamliel, Arthur J. Gartaganis, Ludmilla K. Murphy, Thomas Nardone, H. James Neary, Jon Q. Sargent, Stephen G. Tise, and Martha C. White. The occupational data in appendix A were compiled by Joel P. Segaloff and Audrey J. Watson. Rosalind Springsteen and Mary Ellen Ayres of the Office of Publications coordinated the gathering and editing of photographs.

Under the direction of Beverly A. Williams, word processing was handled by Brenda A. Marshall, Marilyn W. Queen, and Idena B. Sanders.

Note

A great many trade associations, professional societies, unions, industrial organizations, and government agencies provide career information that is valuable to counselors and jobseekers. For the convenience of *Handbook* users, some of these organizations are listed at the end of each occupational statement. Although these references were carefully compiled, the Bureau of Labor Statistics has neither authority nor facilities for investigating the organizations or the information or publications that may be sent in response to a request and cannot guarantee the accuracy of such information. The listing of an organization, therefore, does not constitute in any way an endorsement or recommendation by the Bureau either of the organization and its activities or of the information it may supply. Each organization has sole responsibility for whatever information it may issue.

The occupational information contained in the *Handbook* presents a general, composite description of jobs and cannot be expected to reflect work situations in specific establishments or localities. The *Handbook*, therefore, is not intended and should not be used as a guide for determining wages, hours, the right of a particular union to represent workers, appropriate bargaining units, or formal job evaluation systems. Nor should earnings data in the *Handbook* be used to compute future loss of earnings in adjudication proceedings involving work injuries or accidental deaths.

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How To Get the Most From the Handbook

Whether you are preparing to enter the world of work for the first time, pursuing postsecondary education, planning to reenter the labor force after an absence, or considering changing occupations, you probably have many questions about the job market. Among the many resources available to help you make an informed career choice is the *Occupational Outlook Handbook.*

The *Handbook* describes in detail about 200 occupations—comprising about 3 of every 5 jobs in the economy. Although occupations covering the full spectrum of work are included, generally those that require lengthy education or training or which are projected to grow rapidly are given the most attention. Thus, as the following tabulation shows, more than 90 percent of all technicians and related occupations, as well as of professional specialties, are covered, but only 10 percent of the handler, equipment cleaner, helper, and laborer occupations.

Occupational group	Percent of group covered
Technicians and related occupations	98
Professional specialty occupations	92
Construction occupations	90
Mechanics and repairers	87
Transportation and material moving occupations	83
Management support occupations	72
Marketing and sales occupations	66
Service occupations	63
Administrative support occupations, including clerical	53
Extractive occupations	46
Agricultural, forestry, and fishing occupations	41
Production occupations	40
Managers and administrators	13
Handlers, equipment cleaners, helpers, and laborers	10

Besides these 200 detailed analyses, information about 200 occupations—comprising 20 percent of all jobs in the economy—is presented in an appendix beginning on page 469. Included is a brief occupational description along with the number of jobs in 1984 and a phrase describing projected employment change from 1984 to 1995. This information is developed as part of the Bureau's ongoing industry and occupational employment projections program.

The *Handbook* is not meant to be read from beginning to end. Start by browsing through the table of contents or the alphabetical index. Look for occupations that interest you, or for those that sound familiar. Occupations are grouped in clusters of related occupations that adhere in principle to the system outlined in the 1980 *Standard Occupational Classification Manual.*

For an overview, read the introductory chapter, Tomorrow's Jobs. It discusses some of the broad trends that are likely to shape the economy and the world of work through the mid-1990's.

Matching Yourself With the World of Work

Important as it is to learn about the world of work, the first step in making a sound career choice is finding out about yourself. Identifying your interests and abilities can help you match yourself to the world of work. Does science or math interest you? Do you like to write? Do you enjoy working with your hands and building things? The answers to such questions can help you discover your strengths, and may suggest careers that would be worthwhile to explore.

An understanding of your values and goals also will help you determine what you're looking for in a career. For when you make a career choice, you're directly or indirectly making decisions about the types of people you will associate with, the amount of leisure time you will have, where you will live and work, the amount of job security you will enjoy, and the level of earnings you are likely to have. These decisions depend on values you already hold.

Publications on career decisionmaking abound, and these generally explain how you can assess your values and skills on your own. Counselors and other professionals trained in human behavior also can help you gain insight into yourself by administering diagnostic tests, for example, and then interpreting and discussing the results with you.

Woven throughout every statement in the *Handbook* is information that can help you match yourself to the world of work. The following list of job characteristics should be kept in mind, since you will find them mentioned in several different sections of a typical *Handbook* statement. Remember that the importance of attributes such as those listed below varies from job to job, as well as from person to person.

—*Able to see results*—refers to jobs that produce an actual product or accomplishment.

—*Competition on the job*—competition with coworkers for projects, recognition, or advancement is an integral part of the job.

—*Creativity*—involves devising new ideas, programs, designs, or products.

—*Frequent public contact*—involves day-to-day contact with people who need information or service.

—*Generally confined*—involves staying in one place most of the time.

—*Hazardous*—involves the use of potentially dangerous equipment or materials or work in dangerous surroundings.

—*Influences others*—requires the ability to stimulate others to think or act in a certain way.

—*Initiative*—demands the ability to determine on one's own what should be done, as well as the motivation to do it without close supervision.

—*Instructs others*—needs the ability to help others learn how to do or understand something.

—*Outdoors*—requires a major portion of time to be spent outdoors, frequently without regard to weather conditions.

—*Part time*—refers to work of less than 35 hours a week.

—*Physical stamina*—involves the ability to lift heavy objects, walk long distances, stand for long periods, or stoop frequently.

—*Precision*—involves high standards of accuracy.

—*Problem-solving ability*—requires the ability to identify a problem and then decide what should be done to correct it.

—*Repetitious*—involves work in which the same thing is done over and over again.

—*Uses tools, machinery*—takes a talent for working with your hands and machines to produce, maintain, or repair something.

—*Works as part of a team*—cooperation with coworkers is an integral part of the job.

—*Works with detail*—involves technical data, numbers, or written materials.

Suppose you have a flair for writing and want to put your talent to work in the field of communications or publishing. You might look for a job as a:

—Journalist
—Public relations specialist
—Technical writer
—Editor

Writing and publishing jobs aren't the only ones that require an excellent command of language, however. Communications skills are vital to many occupations, and the more skills people have in English and language arts, the more valuable they will be in the working world.

To locate *Handbook* statements on occupations that require writing skills, start with the section on communications occupations, but remember that that is only the beginning! Skim the table of contents, or read the introductory material at the beginning of each occupational cluster, to determine which other occupations are worth investigating.

Don't limit yourself by examining only a few occupations. You'll want to begin with those that interest you most, of course, but don't rule out others too soon. Some jobs may not appeal to you simply because you're not familiar with them. They might be worth looking into. Remember, also, that you haven't wasted your time if you investigate a career only to decide that it's not right for you.

What's In the Handbook

Once you have chosen an occupation you'd like to learn more about, you can use the *Handbook* to find out what the job is like, what education and training are needed, what the advancement possibilities, earnings, and job outlook are likely to be, and what related occupations you might want to explore. Each statement in the *Handbook* follows a standard format, making it easier to compare different jobs. What follows is a description of the major sections of a *Handbook* statement, plus some hints on how to use the information.

About Those Numbers at the Beginning of Each Statement

The numbers in parentheses that appear just below the title of most occupational statements are D.O.T. codes. D.O.T. stands for the *Dictionary of Occupational Titles*, a U.S. Department of Labor publication. Each number helps classify jobs by the type of work done, required training, physical demands, and working conditions. D.O.T. numbers are used primarily by State public employment service offices to classify applicants and job openings. They are included in the *Handbook* because some career information centers and libraries use them for filing occupational information. An index in the back of this book cross-references the D.O.T. numbers to occupations covered in the *Handbook*.

Nature of the Work

This section tells what workers typically do on the job, what tools or equipment they use, how closely they are supervised, and how their responsibilities fit in with those of others in the same workplace. In practice, job duties vary a good deal, depending on the size or type of employer. In general, people in small organizations handle a wider variety of tasks than those in large offices or firms, where workers are likely to specialize in one or more aspects of the job.

Working Conditions

When considering an occupation, you may want to find out whether the working conditions suit you. Some aspects of the work may strike you as difficult, dirty, or otherwise undesirable. Other aspects may appeal to you. Most jobs offer a little of both. For example, when overtime is required, employees must give up some of their free time and be flexible in their personal lives. This is offset, however, by the opportunity to earn extra income or time off. This section presents information about work settings and environment, physical and psychological demands, as well as potential hazards.

Employment

This section tells how many jobs there were in the occupation in 1984. The size of an occupation has a lot to do with job prospects because the larger the occupation, the greater the number of openings when workers transfer to other occupations or leave the labor force. In exceptionally large occupations, employment size is the single most important determinant of the number of jobs anticipated through the mid-1990's.

Because of economic necessity or personal desire, some people hold more than one job. About 5 percent of all workers are dual jobholders. Workers in some occupations, such as dental hygienists, may work for more than one employer because jobs are available only on a part-time basis.

This section also tells whether an occupation is concentrated in certain industries or geographic areas. Some jobs are found throughout the country and in almost every industry. Others are concentrated in certain parts of the country. This type of information helps you know where to go to look for the kind of job you want. It also is useful to those who have strong preferences about where they live.

Many people prefer working for themselves rather than being a wage and salary employee. Self-employed workers have greater control over their working conditions, the type of work they do, and their earnings. If this type of employment interests you, you should examine this section carefully because it will tell you what proportion of jobs in the occupation are held by people who are self-employed.

In addition, information on part-time employment may be included. For students, homemakers, retired persons, and others who may want to work part time, knowing which occupations offer good opportunities for part-time work can be a valuable lead in finding a job.

Training, Other Qualifications, and Advancement

This section should be read carefully because preparing for an occupation can mean a considerable investment of time and money. If you currently are in school, it's a good idea to look closely at the high school and college courses considered useful preparation for the career you have in mind.

Workers can prepare for jobs in a variety of ways, including college programs leading to a degree, certificate, or diploma; postsecondary vocational school programs, both public and private; home study courses; government training programs; Armed Forces training, apprenticeships, and other formal training offered by employers; and high school courses. For each occupation, the *Handbook* identifies the type of training generally preferred by employers. In many cases, alternative ways of obtaining training are listed as well. Remember, the amount of training you have often determines the level at which you enter an occupation and the speed with which you advance.

Skills and work habits gained at entry level positions can lead to more responsible, higher paying jobs. This is especially important if you consider that today few people spend their entire adult lives in a single occupation. Roughly 1 worker in 10 changes his or her occupation each year. And most people enter, leave, and reenter the labor force several times over a lifetime.

If a pattern of movement exists from one occupation to another, it usually is discussed in this part of a *Handbook* statement. It is helpful to know that certain jobs are steppingstones to others.

For some occupations, a certificate or license is required for entry. Furthermore, an additional set of credentials is needed to advance within some fields, particularly the health field. For example, despite what might be years of experience in a dentist's office, a dental assistant cannot advance to a job as a dental hygienist without completing a formal program in dental hygiene. This section identifies occupations that require licensure and indicates what the general requirements are. However, States vary in their licensing requirements. If you are considering an occupation that requires a license, be sure to check with the appropriate State agency about specific requirements. Common requirements include completion of a State-approved training or educational program and passing a written examination.

In most occupations, there are no such barriers. People with related education or experience enter and advance without obtaining a license or additional formal education. This is the case in engineering, for example, where some graduates in physics, chemistry, computer science, mathematics, and other fields are hired as engineers directly from college. Others without engineering degrees transfer into engineering from related scientific fields and technician occupations.

Job Outlook

What's the job market like? This is the question uppermost in many people's minds as they try to determine whether a particular career is worth pursuing. What constitutes a "good" or "attractive" job varies with the individual and depends on personal values. But because of the cost—and often the sacrifice—involved in preparing for a career, the likelihood of finding a suitable job is something virtually everyone is interested in.

This, in turn depends on the relationship between the number of openings and the number of people seeking to fill those openings. Getting a job may be difficult if the field is so small that openings are few (actuaries, for example) or so popular that there are many more jobseekers than there are jobs (radio and television announcers and newscasters).

Bear in mind that in any particular occupation, different types of employers are likely to have different hiring preferences. The demand for workers varies according to skill level, specialty, educational background and professional credentials, previous experience, and so forth. Moreover, the supply of qualified jobseekers varies as well. That is why there can be shortages in some communities or in some specialties while qualified applicants are in oversupply in others.

Workers who transfer into one occupation from another sometimes are a significant part of the supply of workers; similarly, those who transfer out may have a substantial effect on demand because their leaving usually creates job openings. When information is available, the job outlook section describes transfer patterns and their effect on the demand for and supply of workers in certain occupations. For example, the employment outlook for engineers recognizes that transfers into the field are likely to constitute a substantial portion of supply, if past trends continue.

Most job outlook sections begin with a statement about the expected change in employment through the mid-1990's. For example, little or no growth is expected in the number of jobs for typists, while the number of jobs for computer and peripheral equipment operators is expected to grow much faster than the average for all occupations. The accompanying figure explains what is meant by these and other key phrases.

If an occupation grows rapidly, it obviously will provide more openings than if it grows slowly. Moreover, the demand for talent in a rapidly growing occupation improves chances for advancement and mobility. Depending on how long it takes for training programs to respond to the heightened demand, jobseekers' prospects may be enhanced by a shortage of qualified applicants.

Slower than average growth may mean relatively unfavorable prospects. For one thing, company personnel policies or collective bargain-

Key Words in the *Handbook*

Changing employment between 1984 and 1995

If the statement reads . . .	Employment is projected to . . .
Grow much faster than the average	Increase 31 percent or more
Grow faster than the average	Increase 20 to 30 percent
Grow about as fast as the average	Increase 11 to 19 percent
Grow more slowly than the average	Increase 4 to 10 percent
Show little change	Increase or decrease 3 percent or less
Decline	Decrease 4 percent or more

Opportunities and competition for jobs

If the statement reads . . .	The demand for workers may be . . .
Excellent opportunities	Much greater than the supply
Very good opportunities	Greater than the supply
Good or favorable opportunities	About the same as the supply
May face competition	Less than the supply
May face keen competition	Much less than the supply

ing agreements designed to provide job security are likely to reduce opportunities for persons not already employed by the firm. Also, programs to retrain company employees dislocated by new technologies have the effect of limiting the number of openings for people outside the firm.

Keep in mind, however, that slow-growing occupations, if large—like typist and bookkeeper—provide large numbers of job openings, which is another measure of favorable outlook. In these occupations, the negative effect of slower than average employment growth is outweighed by the sheer size of the occupation and the consequent number of replacement openings.

The need to replace workers who leave their jobs creates most of the openings in virtually every occupation, regardless of the rate of growth. Replacement rates vary, but it is generally true that the larger the occupation, the more openings there are due to replacements. Factors that determine the number of replacement openings in an occupation include its size, the earnings and status associated with the occupation, the length of training required, the average age of workers, and the proportion of part-time workers. Occupations with the most replacement openings generally are large, with low pay and status, few training requirements, and a high proportion of young and part-time workers. Occupations with relatively few replacement openings, on the other hand, are ones that have high pay and status, lengthy training requirements, and many prime-working-age full-time workers.

The job outlook section also identifies factors that are expected to affect the occupation, such as defense spending, new technologies, changing business practices, and shifting population patterns.

Some statements discuss job security. Recessions make jobseekers painfully aware of the sensitivity of employment to changes in the business cycle, and the *Handbook* provides information on the subject wherever possible. But there are additional factors that make some jobs less secure than others. In the building trades, for example, adverse weather conditions and the short duration of many building projects make construction workers more susceptible to reduced workweeks and higher than average rates of unemployment in good times as well as bad.

For the few occupations—mostly those requiring a high level of education—for which data are available, information is presented on the projected supply of workers—in particular, the number of new graduates or newly qualified workers. New graduates are not the only source of supply, however. Every year, a large proportion of job openings are filled by reentrants or by people transferring from other occupations. In predominantly female occupations, reentrants play an especially important role in supply. Similarly, people transferring from other occupations constitute a substantial portion of the supply of engineers. When information is available, the *Handbook* describes patterns of occupational entry and exit and explains what they mean for the job outlook.

The information in the job outlook section should be used carefully. The prospect of relatively few openings, or of keen competition, in a field that interests you should make you take a second look at your career choice. But this information alone should not prevent you from pursuing a particular career if you are confident about your ability and determined to reach your goal.

Also keep in mind that no one possesses a "crystal ball." Methods used by economists to develop employment projections differ, and the assumptions and judgments that go into any assessment of future job outlook also differ. A summary of the assumptions and methods used by the Bureau of Labor Statistics in making employment projections is presented in an appendix beginning on page 489.

Finally, it is possible that prospects in your community or State do not correspond to the description of the job outlook in the *Handbook*. For the particular job you are interested in, the outlook in your area may be better—or it may be worse.

Because local conditions vary so much, it is wise to talk with counselors, employers, State public employment service staff, and others about the particular area where you want to work. State and local chapters of labor unions and professional associations also may be able to furnish useful leads. The appendix beginning on page 492 provides a list of State officials who should be able to direct you to people familiar with the job market in a particular city or State. Addresses and telephone numbers are given for the State Occupational Information Coordinating Committee directors and for the State employment security agency directors of research and analysis.

Earnings

Many people ask questions such as, "How much does the average plumber earn?" or "What are the highest paying jobs?" or "Who earns more, a secretary or a nurse?"

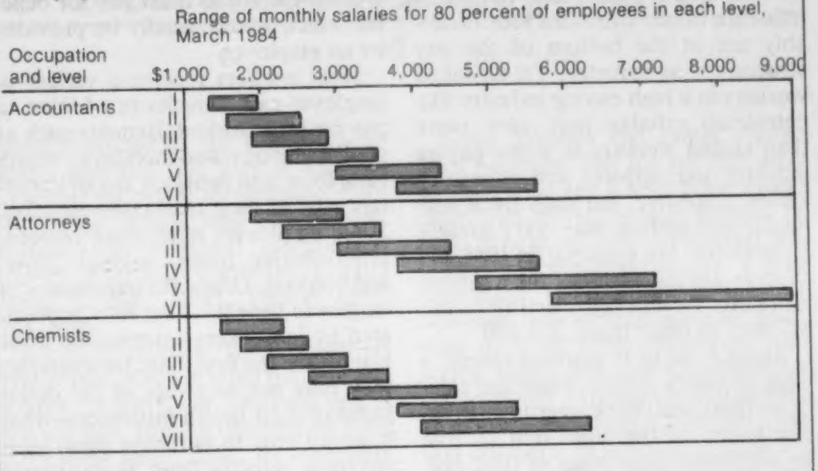
Unfortunately, no single statistic can adequately portray the tremendous differences in earnings of workers in a particular occupation, and it is very easy to be misled. Users should look upon the earnings data presented in this section of a *Handbook* statement as a clue to an occupation's attractiveness and its potential for long-term reward. But keep in mind that the *Handbook* can't predict what you might earn, nor does it try to. Your earnings will depend on many things, including your experience and ability, the firm and industry you work in, and the section of the country where you live.

It is true that major occupational groups exhibit significant differences in pay. Usual weekly earnings of managers and administrators, for example, are about double those of service workers. But there are wide disparities *within* most occupations as well. In fact, earnings within occupations vary so widely that in many cases it is impossible to say which of several jobs would pay best.

Differences in skill are part of the explanation. Within a particular occupation, average salaries of workers at the top levels may be several times as high as those in entry level jobs. The latter usually require less training, embody simpler job functions, and carry little or no supervisory responsibility.

The accompanying chart shows how wide the earnings spread within an occupation can be. Based on 1984 data from the Bureau's annual survey of professional, administrative, technical, and clerical pay, the chart depicts the range in monthly earnings for three occupations: Accountants, attorneys, and chemists. Note that the chart shows six bars each for accountants and attorneys and seven for chemists. These reflect different work levels, starting with entry level jobs and continuing up the career ladder to the most complex and responsible positions within the occupation.

Jobs within an occupation differ in complexity, and pay varies accordingly.



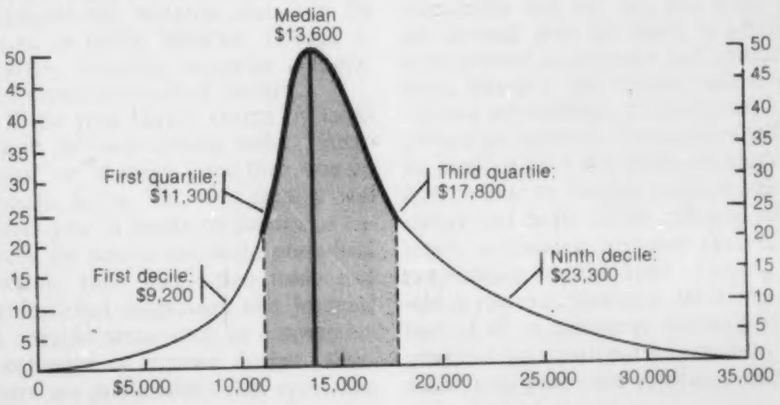
SOURCE: Bureau of Labor Statistics

The Current Population Survey is the source the *Handbook* uses most often to show the spread of earnings within an occupation. Many statements indicate what the median earnings of full-time workers were in 1984, and describe the earnings of the middle 50 percent of workers, the lowest 10 percent, and the highest 10 percent. The data relate to earnings from wages and salaries only; earnings from self-employment are not included.

The accompanying chart, based on data from the Current Population Survey, shows the earnings distribution of secretaries who were employed full time in 1984. Secretaries' earnings, like those of clerical workers in general, cluster tightly around the median (the midpoint in a distribution). The shaded area under the curve indicates that one-half of all full-time secretaries earned between $11,300 and $17,800 in 1984. Earnings of the lowest paid secretaries (the lowest 10 percent) were under $9,200, while those of the highest paid secretaries (the highest 10 percent) exceeded $23,000. In other words, only 1 secretary in 10 made as little as $9,200 or as much as $23,000 in 1984.

Half of all secretaries earned between $11,300 and $17,800 in 1984.

Percent distribution of full-time secretaries by annual earnings, 1984



SOURCE: Bureau of Labor Statistics

Geographic variations account for some of the differences in occupational pay. While location is an important factor for nearly all workers, it is especially important for unskilled workers, whose pay levels are strongly affected by local market conditions. Earnings generally are higher in the West than in the Midwest, North, and South, but there are exceptions. Keep in mind that the cities that offer the highest earnings often are those in which it is most expensive to live.

Differing pay scales among establishments, unionization, seniority, and quality of performance are other factors that help explain why the earnings of individuals in the same occupation may vary greatly.

But the industry in which a job is located may be the most important influence of all. Unskilled jobs invariably are at the bottom of the pay structure in an industry. Yet unskilled workers in a high-paying industry like petroleum refining may earn more than skilled workers in a low-paying industry like apparel and accessory stores. Likewise, earnings for a particular occupation may vary greatly by industry. For example, in 1984, the average annual earnings for a janitor working in manufacturing were $17,400; in retail trade, $11,300.

About 9 out of 10 workers receive a wage or salary. Often, wage and salary workers who work overtime, irregular hours, or the night shift receive an additional percentage of their regular wage or salary. In addition, workers in some wage and salary occupations can supplement earnings by working additional hours outside of their regular jobs. For example, typists, photographers, and graphic artists all have skills that permit them to earn extra income on a freelance basis.

About 10 percent of all workers are in business for themselves and earn self-employment income instead of, or in addition to, a wage or salary. Earnings of self-employed workers tend to vary more than those of salaried workers, and most workers who are self-employed must pay for benefits which would usually be provided by an employer.

Most workers receive a variety of employer-paid benefits in addition to pay for time worked. Benefits such as paid vacations and holidays, health insurance, and pensions are an important part of their total compensation. Some employers offer stock options, profit-sharing plans, savings plans, and bonuses. Often, the importance of employee benefits is not fully appreciated by jobseekers entering the labor market for the first time; for example, they may not be aware of the dollar value of their health insurance—what it would cost to purchase equivalent coverage directly from an insurance company.

Workers in many occupations receive part of their remuneration in the form of goods and services, or payments in kind. Sales workers in department stores, for example, often receive discounts on merchandise. Some private household workers receive free meals and housing. Flight attendants and other airline employees often are entitled to reduced fares for themselves and their families. Workers in other jobs may receive uniforms, business expense accounts, or use of a company car. Others receive payment in the form of tips for the services they provide to customers, commissions based on a percentage of what they sell, or a piece rate for each item they produce.

Related Occupations

If you find that an occupation appeals to you, you also may wish to explore the jobs listed in this section. Usually, the related occupations are those that require similar aptitudes, interests, and education and training.

Sources of Additional Information

The *Handbook* is only one source of career information. Many associations, government agencies, unions, and other organizations provide useful information on careers. In this section, names and addresses of various organizations are listed to help you further your research into careers that interest you. Also, for some occupations, this section refers you to free or relatively inexpensive publications that offer more information. These publications may be available in libraries, school career centers, or guidance offices.

Where To Go For More Information

The *Occupational Outlook Handbook* is a good place to begin if you have questions about a particular job or want to compare the job prospects in various fields. It will answer many of your questions, but it is only one of many sources of information about jobs and careers. After reading a few *Handbook* statements, you may decide that you want more detailed information about a particular occupation. You may want to find out where you can go for training, or where you can find this kind of work in your community. If you are willing to make an effort, you will discover that a wealth of information exists.

Sources of Career Information

Professional societies, trade associations, labor unions, business firms, and educational institutions publish a great deal of free or inexpensive career material. Many of these organizations are identified in the Sources of Additional Information section of each *Handbook* statement.

If you want information for an occupation not covered in the *Handbook*, check the directories in your library's reference section for the names of organizations that may provide career materials. Since there are thousands of directories covering a wide variety of fields, you may want to begin by looking in the *Guide to American Directories* or *The Dictionary of Directories*. There are directories that list organizations, firms, and individuals in fields as diverse as publishing, advertising, banking, insurance, retailing, manufacturing, health care, energy, the environment, performing arts, social welfare, education, training and development, management consulting, and many more. Another good starting point is the *Encyclopedia of Associations*, a multivolume annual publication that lists thousands of trade associations, professional societies, labor unions, and fraternal and patriotic organizations.

The National Audiovisual Center, a central source for all audiovisual material produced by the U.S. Government, provides free lists of material available for rental or purchase. Subject areas include jobs and careers. Contact the National Audiovisual Center, 8700 Edgeworth Dr., Capitol Heights, Md. 20743. Phone: (301) 763–1896.

Carefully assess all career materials you obtain. Keep in mind the date and source, in particular. Material that is too old may contain obsolete or even misleading information. Be especially cautious about accepting information on employment outlook, earnings, and training requirements if it is more than 5 years old. The source is important because it affects the content. Although some occupational materials are produced solely for the purpose of objective vocational guidance, others are produced for recruitment purposes. You should be wary of biased information, which may tend to leave out important items, overglamorize the occupation, overstate the earnings, or exaggerate the demand for workers.

Libraries, career centers, and guidance offices are important sources of career information. Thousands of books, brochures, magazines, and audiovisual materials are available on such subjects as occupations, careers, self-assessment, and job hunting. Your school library or guidance office is likely to have some of this material; ask the staff for help. Collections of occupational material also can be found in public libraries, college libraries, learning resource centers, and career counseling centers.

Begin your library search by looking in the card catalog under "vocations" or "careers," and then look up specific fields. The card catalog will direct you to books on particular careers. Be sure to check the periodical section, too. You'll find trade and professional magazines and journals in specific areas such as automotive mechanics or interior design. Also, there are publications that specialize in career guidance, job hunting, and employment opportunities.

Many libraries and career centers have pamphlet files for specific occupations. Also ask if your library has a collection of corporate annual reports. These will give you some idea of the business activities of a firm. Collections of occupational information may also include nonprint materials such as films, filmstrips, cassettes, tapes, and kits. Computerized occupational information systems enable users to obtain career information instantly. In addition to print and nonprint materials, most career centers and guidance offices offer individual counseling, group discussions, guest speakers, field trips, and career days.

Counselors play an important role in providing career information. Vocational testing and counseling are available in a number of places, including:

—guidance offices in high schools.
—career planning and placement offices in colleges.
—placement offices in vocational schools.
—vocational rehabilitation agencies.
—counseling services offered by community organizations.
—private counseling agencies, commercial firms, and professional consultants.
—State public employment service offices affiliated with the U.S. Employment Service.

The reputation of a particular counseling agency should be checked with professionals in the field. As a rule, counselors will not tell you what to do. Instead, they are likely to administer interest inventories and aptitude tests, interpret the results, talk over various possibilities, and help you explore your options. Counselors should be familiar with the local job market and be able to discuss entry requirements and costs of the schools, colleges, or training programs that offer preparation for the kind of work in which you are interested. Most important of all, a counselor can help you interpret occupational information in relation to your own abilities, aspirations, and goals.

One way to learn more about an

occupation is through an internship with a government agency or corporation. An internship allows you to find out about the nature of the work, the working conditions, and whether you want to pursue a career in this field. Some internships offer academic credit or pay a stipend in addition to providing valuable job experience. More important, you will have the opportunity to establish contacts which might be useful later when you are looking for a job. Many guidance offices and college career resource centers can provide information about internships. Or you might try contacting a company or government agency directly to find out if they have an internship program.

Don't overlook the importance of **personal contacts.** Talking with people is one of the best ways of learning about an occupation. Most people are glad to talk about what they do and how they like their jobs. Have specific questions ready; you might ask workers about the type of work they do and how long they have worked in their field. By asking the right questions, you will find out what kind of training is really important, how workers got their first job as well as the one they're in now, and what they like and dislike about the work. These interviews serve several purposes: You get out into the business world, you learn about an occupation, you become familiar with interviewing, and you meet people worth contacting when you start looking for a job.

Sources of State and Local Information

The *Handbook* only provides information for the Nation as a whole. **State occupational information coordinating committees (SOICC's)** can help you locate information about job prospects in your State or area. The committee may provide the information directly or refer you to other sources. In many States, it can tell you where you can go to use the State's career information delivery system (CIDS).

These systems, currently in place in most States, provide national, State, and local information to individuals who are exploring careers or searching for jobs. These services can be found in secondary schools, postsecondary institutions, libraries, job training sites, and vocational rehabilitation centers.

Using a variety of means, including on-line computers, microcomputers, printed material, needlesorts, microfiche, and toll-free hotlines, these systems provide information on occupations, educational opportunities, student financial aid, apprenticeships, and the military services.

To find out what kinds of career materials have been developed for your State, contact the director of the State occupational information coordinating committee. Addresses and telephone numbers for these individuals are listed in an appendix beginning on page 492.

State employment security agencies develop detailed information about the labor market. Typically, State agencies publish reports that deal with current and projected employment, characteristics of the work force, changes in State and area economic activities, and the employment structure of important industries. Major statistical indicators of labor market activity are released on a monthly, quarterly, or annual basis. To learn which studies, reports, and analyses are available for a particular State, contact the chief of research and analysis in the State employment security agency. Addresses and telephone numbers for these individuals are also listed.

Sources of Education and Training Information

As a rule, professional or trade associations can provide lists of schools that offer career preparation in a particular field. Whenever possible, the Sources of Additional Information section of each *Handbook* statement directs you to organizations that can provide training information.

For general information, a library, career center, or guidance office may be the best place to look; all of them ordinarily have collections of catalogs, directories, and guides to education and training opportunities. Computerized career information systems also generally provide information on education and training, student financial aid, and other items of interest.

A number of handbooks give pertinent information on courses of study, admissions requirements, expenses, and student financial aid at various education and training institutions or settings. Guidance offices and libraries almost always have copies, as do large bookstores. Remember that these directories are updated and revised frequently; be sure to use the most recent edition. Guidance offices and libraries have collections of college catalogs as well.

Directory of Educational Institutions, an annual publication, lists schools accredited by the Association of Independent Colleges and Schools (AICS). Most AICS-accredited institutions are business schools. They offer programs in secretarial science, business administration, accounting, data processing, court reporting, paralegal studies, fashion merchandising, travel/tourism, culinary arts, drafting, electronics, and more. For a copy of the *Directory*, write: Association of Independent Colleges and Schools, 1 Dupont Circle NW., Suite 350, Washington, D.C. 20036. Phone: (202) 659-2460.

Information on private trade and technical schools is available from the National Association of Trade and Technical Schools (NATTS). Among their many publications are the *Handbook of Trade and Technical Careers and Training, How to Choose a Career and a Career School,* and *College Plus: Put Your Degree to Work with Trade and Technical Skills*. For a complete list, contact NATTS at 2251 Wisconsin Ave. NW., Suite 200, Washington, D.C. 20007. Phone: (202) 333-1021.

The National Home Study Council supplies information about home study programs. Among the publications they distribute is a *Directory of Accredited Home Study Schools*. Requests for this publication and information about other publications should be directed to National Home Study Council, 1601 18th St. NW., Washington, D.C. 20009. Phone: (202) 234-5100.

Labor unions and school guidance offices can provide information about apprenticeships. State public employment offices usually have a staff member familiar with apprenticeship programs in their local area who can direct you to program sponsors for more specific help. For women interested in learning about apprenticeship opportunities, the Women's Bureau of the U.S. Department of Labor publishes *A Woman's Guide to Apprenticeship*. To get a copy, send a self-addressed mailing label to: Women's Bureau, U.S. Department of Labor, Room S-3306, 200 Constitution Ave. NW., Washington, D.C. 20210. Phone: (202) 523-6668.

Sources of Financial Aid Information

If possible, consult a high school guidance counselor or college financial aid officer for advice on sources of financial aid. Don't neglect any possibility, for many organizations offer scholarships, fellowships, grants, loans, and work-study programs. Each State administers financial aid programs, and information about them can usually be obtained through the State's Department of Education. Because student loans are administered by many private financial institutions, your local bank or credit union should not be overlooked as a potential source of information. Study the directories and guides to sources of student financial aid available in guidance offices and public libraries. Many career information systems also provide information on financial aid.

Particularly useful is the American Legion's *Need a Lift?*, a booklet containing career and scholarship information for both undergraduate and graduate students. The 1985 edition costs $1 prepaid (includes postage) and can be obtained from: American Legion, Attn: Need a Lift?, P.O. Box 1050, Indianapolis, Ind. 46206.

Meeting College Costs, a College Board publication that is updated annually, explains how to apply for student financial aid. High school students should ask their guidance counselors for the current edition. A listing of other College Board publications may be obtained from: College Board Publications, Box 886, New York, N.Y. 10101.

The Federal Government provides several kinds of financial assistance to students: Grants, loans, work-study, and benefits. Like all Federal programs, Federal student aid is dependent upon funding levels set by the President and Congress. Information about programs administered by the U.S. Department of Education is presented in a pamphlet entitled *The Student Guide to Federal Financial Aid Programs*. This pamphlet is revised every year; request the current edition by calling (301) 984–4070, or by writing to: Federal Student Aid Programs, P.O. Box 84, Washington, D.C. 20044.

Some student aid programs are designed to assist specific groups: Hispanics, blacks, native Americans, or women, for example. *Higher Education Opportunities for Minorities and Women*, published by the U.S. Department of Education, is a useful guide to organizations that offer loan, scholarship, and fellowship assistance, with special emphasis on aid for minorities and women. Opportunities for financial aid are listed by field of study and educational level. This publication can be found in many libraries and guidance offices, or may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The branches of the Armed Forces have several programs that provide financial assistance for education. These include Reserve Officers' Training Corps (ROTC), the New G.I. bill, and tuition assistance. More information can be obtained from military recruiting centers, which are found in most cities.

Career and Counseling Information for Special Groups

Certain groups of jobseekers face special difficulties in obtaining suitable and satisfying employment. All too often, veterans, youth, handicapped persons, minorities, and women experience difficulty in the labor market. The reasons for job market disadvantage vary, of course. People may have trouble setting career goals and looking for work for reasons as different as a limited command of English, a prison record, or lack of self-confidence. Some people are held back by their background—by growing up in a setting that provided only a few role models and little exposure to the wide range of opportunities in the world of work.

A growing number of communities have career counseling, training, and placement services for people with special needs. Programs are sponsored by a variety of organizations, including churches and synagogues, nonprofit organizations, social service agencies, the State public employment service, and vocational rehabilitation agencies. Some of the most successful programs provide the extensive support that disadvantaged jobseekers require. They begin by helping clients resolve personal, family, or other fundamental problems that prevent them from finding or keeping a suitable job. Some agencies that serve special groups provide an array of supportive services designed to help people find and keep jobs.

Agencies that provide employment counseling as well as other kinds of assistance are identified in the *Directory of Counseling Services*, published by the American Association for Counseling and Development (AACD), 5999 Stevenson Ave., Alexandria, Va. 22304. A copy may be available in your library or school career counseling center.

Several public and private agencies provide information, such as publications or referral services, on career planning and job hunting techniques that are geared toward special groups. The organizations listed below should be able to provide you with such information:

Handicapped: President's Committee on Employment of the Handicapped, 1111 20th St., NW., Room 636, Washington, D.C. 20036. Phone: (202) 653–5044.

Job Opportunities for the Blind: Call 1-800-638-7518 for toll-free information for blind and deaf-blind.

Minorities: League of United Latin American Citizens, National Educational Service Centers, 400 First St. NW., Suite 716, Washington, D.C. 20001. Phone: (202) 347-1652.

National Association for the Advancement of Colored People (NAACP), 186 Remsen St., Brooklyn, N.Y. 11201. Phone: (718) 858-0800.

Older Workers: National Association of Older Workers Employment Services, c/o National Council on Aging, 600 Maryland Ave. SW., Washington, D.C. 20024. Phone: (202) 479-1200.

Veterans: Department of Veterans Benefits, Veterans Administration Central Office, 810 Vermont Ave. NW., Washington, D.C. 20420. Phone: (202) 393-4120.

Women: U.S. Department of Labor, Women's Bureau, 200 Constitution Ave. NW., Washington, D.C. 20210. Phone: (202) 523-6652.

Catalyst, 250 Park Ave. South, New York, N.Y. 10003. Phone: (212) 777-8900.

Wider Opportunities for Women, 1325 G St. NW., Lower Level, Washington, D.C. 20005. Phone: (202) 638-3143.

In addition to these agencies, there

are many local organizations that provide employment information or counseling programs. Women's centers, many of which are located on college campuses, are an excellent resource for women seeking assistance. Many cities have commissions that attend to the concerns of special groups, and they may provide services that may be of help to you.

Federal laws, Executive Orders, and selected Federal grant programs bar discrimination in employment based on race, color, religion, sex, national origin, age, and handicap. Employers in the private and the public sectors, Federal contractors, and grantees are covered by these laws. The U.S. Equal Employment Opportunity Commission (EEOC) is responsible for administering many of the programs that prohibit discrimination in employment. Information about how to file a charge of discrimination is available from local EEOC offices around the country. Their addresses and telephone numbers are listed in telephone directories under U.S. Government, EEOC, or are available from: Equal Employment Opportunity Commission, 2401 E St. NW., Washington, D.C. 20507. Phone: (202) 634-6922.

Information on Federal laws concerning fair labor standards—including the minimum wage law—and equal employment opportunity can be obtained from the Office of Information and Consumer Affairs, Employment Standards Administration, U.S. Department of Labor, Room C-4331, 200 Constitution Ave. NW., Washington, D.C. 20210.

Information on Finding a Job

These days, a well-planned job search is essential. For information on job openings, follow up as many leads as possible. Parents, neighbors, teachers, and counselors may know of available jobs. Look at the want ads. Check with your local State public employment service office and find out whether private or nonprofit employment agencies in your community can help you.

Merchandising Your Job Talents, a pamphlet prepared by the U.S. Department of Labor, offers tips on organizing your job search, writing a resume, taking preemployment tests, and making the most of the interview. It is available at most State public employment service offices or may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Where to Find Out About Job Openings

- State public employment service offices
- Civil service announcements (Federal, State, local)
- Classified ads
    - —Local and out-of-town newspapers
    - —Professional journals
    - —Trade magazines
- Labor unions
- Professional associations (State and local chapters)
- Libraries and community centers
- Women's counseling and employment programs
- Youth programs
- School or college placement services
- Employment agencies and career consultants

Informal job search methods. Informal methods of job search are the most popular, and can be very effective. Informal methods include direct application to employers with or without referral by friends or relatives. Jobseekers locate a potential employer and file an application, often without certain knowledge that an opening exists.

You can find targets for your informal search in several ways. The *Yellow Pages* and local chambers of commerce provide the names and addresses of firms in the community where you may wish to work. You can also get listings of most firms in a specific industry—banking, insurance, and newspaper publishing, for example—by consulting one of the directories on the reference shelf of your public library. Friends, relatives, and people you meet during your job search are likely to give you ideas about places where you can apply for a job.

Want ads. The "Help Wanted" ads in newspapers contain hundreds of job listings. As a job search tool, they have two advantages: They are cheap and easy to acquire, and they often result in successful placement. There are disadvantages as well. Want ads give a distorted view of the local labor market, for they tend to underrepresent small firms. They also tend to overrepresent certain occupations, such as clerical and sales jobs. How helpful they are will depend largely on the kind of job you seek.

Bear in mind that want ads do not provide complete information; many give little or no description of the job, working conditions, and pay. Some omit the identity of the employer. In addition, firms often run multiple listings. Some ads offer jobs in other cities (which do not help the local worker); others advertise employment agencies rather than employment.

If you use want ads, keep the following suggestions in mind:

—Don't rely exclusively on want ads; follow up other leads, too.

—Answer ads promptly. The opening may be filled before the ad stops running.

—Follow the ads diligently. Checking them every day as early as possible gives you the best advantage over other applicants, which may mean the difference between a job and a rejection.

—Don't expect too much from "blind ads" that do not reveal the employer's identity. Employers use blind ads to avoid being swamped with applicants, or to fill a particular vacancy quietly and confidentially. The chances of finding a job through blind ads tend to be slim.

—Be cautious about answering "no experience necessary" ads. Most employers are able to fill job openings that do not require experience without advertising in the newspaper. This type of ad may mean that the job is hard to fill because of low wages or poor working conditions, or because it is straight commission work.

—Keep a record of all ads to which you have responded.

Public employment service. The State public employment service, sometimes called the Job Service, is often overlooked in finding out about local job openings. Run by the State employment security agencies in coordination with the Labor Department's U.S. Employment Service, the approximately 2,000 local public employment service offices provide assistance without charge. State public employment service staff help jobseekers find employment and help employers find qualified workers. To find the office nearest you, look in the State government telephone listings under "Job Service" or "Employment."

Job matching and referral. Upon entering a State employment service center, an applicant is interviewed to determine the type of work for which he or she indicates an interest and aptitude. The interviewer determines if the applicant is "job ready" or if counseling and testing services are needed. Applicants who know what kind of work they are qualified for may spend some time examining the Job Bank, a computerized listing of public and private sector job openings that is updated every day. The Job Bank is self-service; applicants examine a book or microfilm viewer and select openings that interest them. Afterwards, a staff member may describe a particular job opening in some detail and arrange for an interview with the prospective employer.

Counseling and testing. These centers also help jobseekers who are uncertain about their qualifications and the kind of work they want. Many centers are staffed with a specialist who is able to provide counseling and testing services. Counselors help jobseekers choose and prepare for an occupation based on their qualifications and interests. They aim to help individuals become aware of their job potential and then develop it. The testing program measures occupational aptitudes, clerical and literary skills, and occupational interests. Testing and counseling before job referral ensure a better match between applicant and job.

Services for special groups. By law, veterans are entitled to priority in interviewing, counseling, testing, job development, and job placement at State employment service centers. Although some veterans may find it difficult to adjust to civilian life, joblessness is a major barrier to resuming an ordinary life. Special counselors called veterans employment representatives are trained to deal with the particular problems of veterans. Through these representatives, veterans can learn about the many kinds of assistance available to them.

A special effort is made to assist youth between the ages of 16 and 21—students, dropouts, and graduates entering the labor market. Youthful applicants are tested, counseled, and aided in choosing work that suits their abilities and interests. Each year, State public employment service centers conduct a Summer Youth Program to provide summer jobs in city, county, and State government agencies for low-income youth. In addition, the Job Corps, with more than 100 centers throughout the United States, provides an opportunity for young people to learn a skill or obtain the educational base needed to advance in society.

The State public employment service centers also refer applicants to opportunities available under the Job Training Partnership Act (JTPA) of 1982. JTPA focuses on preparing economically disadvantaged persons for jobs in the private sector.

Private employment agencies. In the appropriate section of the classified ads or the telephone book, you can find numerous advertisements for private employment agencies. All are in business to make money, but some offer higher quality service and better chances of successful placement than others. The three main places where private agencies advertise are newspaper want ads, the Yellow Pages, and trade journals. Telephone listings give little more than the name, address, phone number, and specialty of the agency, while trade journals generally advertise openings for a particular occupation, such as accountant or computer programmer. Want ads, then, are the best source of general listings of agencies.

These listings fall into two categories—those offering specific openings

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Job Interview Tips

Preparation:
- Learn something about the company
- Have specific job or jobs in mind
- Review in your mind your qualifications for the job
- Be prepared to answer broad questions about yourself
- Review your resume
- Be there a few minutes before the scheduled time of your interview

Personal Appearance:
- Well groomed
- Suitable dress
- No chewing gum
- Only smoke when invited

The Interview:
- Answer each question as well as you can
- Be prompt in giving responses
- Be well mannered
- Use good English and avoid the use of slang
- Be cooperative and enthusiastic
- Don't be afraid to ask questions

Test (if employer gives one):
- Listen carefully to instructions
- Read each question carefully
- Write legibly and clearly
- Budget your time wisely and don't stay on one question too long

Information to Take With You:
- Social Security number
- Driver's license number
- Resume. Although not all positions require job applicants to bring a resume, you should be able to furnish the interviewer with information about your education and previous employment
- Usually an employer requires three references. Get permission from people before using their names. If you can avoid it, do not use the names of relatives. For each reference, give the following information: Name, address, telephone number, and occupation

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What Goes Into a Resume

A resume summarizes your personal qualifications and employment history. It is usually required when applying for a managerial, administrative, professional, or technical position. Although a resume varies by the individual, most resumes contain the following information in some form:

- Name, address, and telephone number.
- Employment objective.
- Education, which should include school name and address, dates of attendance, curriculum, and highest grade completed or degree awarded.
- Experience, paid or volunteer. Include the following for each job: Job title, name and address of employer, and dates of employment.
- Special skills, knowledge of machinery, awards, or membership in organizations.
- Availability of references.

and those offering a general promise of employment. You should concentrate on the former and use the latter only as a last resort. With a specific opening mentioned in the ad, you have greater assurance of the agency's desire to place qualified individuals in suitable jobs.

When responding to such an ad, you may learn more about the job over the phone. If you are interested, visit the agency, fill out an application, present a resume, and talk with an interviewer. The agency will then arrange an interview with the employer if you are qualified, and perhaps suggest alternative openings if you are not.

Most agencies operate on a commission basis, with the fee dependent upon a successful match. The fee may be paid by either the applicant or the hiring firm. If borne by you, find out the exact cost before using the service.

Community agencies. A growing number of nonprofit organizations throughout the Nation provide counseling, career development, and job placement services. These agencies generally concentrate on services for a particular labor force group—women, youth, minorities, ex-offenders, or older workers, for example. It's up to you to discover whether your community has such agencies and whether they can help you. The local State public employment service office should be able to tell you whether such an agency has been established in your community. Your church, synagogue, or local library may have the information, too.

College career planning and placement offices. Career planning and placement offices at colleges and universities offer valuable services to students and alumni for a modest fee. Many services, in fact, are free. College placement offices operate as employment agencies, matching applicants with suitable jobs and lining up interviews. On large campuses, for example, they set up schedules and facilities for interviews with industry recruiters. And many offices maintain lists of local part-time, temporary, and summer jobs.

College career planning and placement offices also provide services related to counseling and job search techniques. They may, for example, maintain a career resource library; administer tests that enable students to identify and evaluate interests, work values, and skills; conduct workshops on such topics as job search strategy, resume writing, letterwriting, and effective interviewing; critique drafts of resumes and videotapes of mock interviews; maintain files of resumes and references; and conduct job fairs.

Tomorrow's Jobs

The number and kinds of jobs needed in tomorrow's economy will depend on the interplay of demographic, economic, social, and technological factors. Employment in some occupations will grow much faster than the average rate of growth; others will decline in importance. Some jobs will emerge as a result of new technologies; others will disappear. And the nature of the work in many occupations probably will change.

The *Handbook* presents information about the job outlook for many occupations. In this chapter, which provides background for those discussions, you will find information about expected changes in the population, the labor force, and employment in major industrial sectors and broad occupational groups. Finally, there is a brief discussion of the importance of replacement needs in the employment outlook.

Population

Changes in population are among the basic factors that will alter employment opportunities. Changes in the size and characteristics of the population cause changes in the amount and types of goods and services demanded. These changes also alter the size and characteristics of the labor force—the people who are working and who are looking for work—which in turn can influence the amount of competition for jobs in an occupation. Three important population factors are population growth, shifts in the age structure of the population, and movement of the population within the country.

Growth. The population of the United States increased rapidly during the post-World War II "baby boom." During the 1960's, the rate of population growth dropped sharply and has remained at a low level since (chart 1).

In 1984, the population was about 237 million. It is expected to continue to increase slowly to about 260 million by 1995. Continued population growth will mean more consumers to provide with goods and services, causing greater demand for workers in many industries and occupations.

Age structure. Over time, the age structure of the population changes. Shifts in the age structure affect the job market in many ways. The low population growth of the 1960's and 1970's, for example, resulted in a decrease in the number of school-age children in the 1970's. This decrease lowered the demand for educational services and the employment opportunities in teaching. During the 1970's, as the large number of people born during the 1950's entered the labor force, competition increased for entry level jobs.

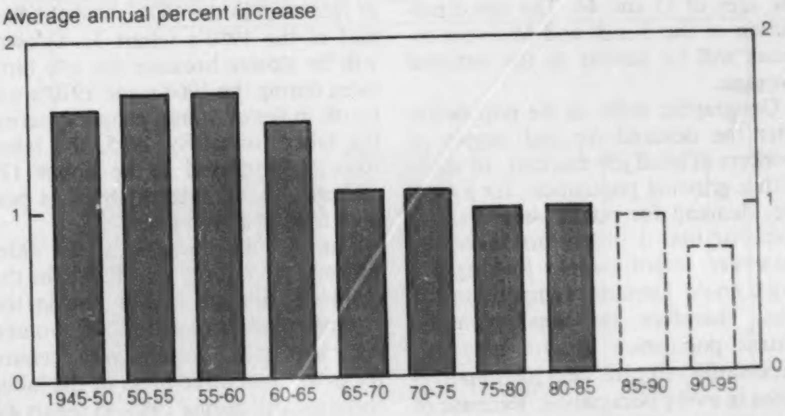
Through the mid-1990's, the age structure of the population will continue to shift and affect the job market. The number of children under 13 will increase as the large number of people born during the baby boom have children of their own. As the baby-boom group ages, the number of people age 35 to 54 will increase. The number of people 65 and older will rise sharply because of the relatively high population growth before the 1930's and increases in life expectancy. Because of low population growth during the 1970's and 1930's, the number of 14- to 25-year-olds and 55- to 64-year-olds will decline by 1995.

Increases in the number of children will cause greater demand for elementary school education through 1995. The increase in the number of older people will add to the demand for health services. Shifts in the age structure of the population also will affect the age structure of the labor force, discussed in a later section.

Movement of population. Population growth varies among the regions of the Nation. For example, between 1970 and 1980, the population of the Northeast and the Midwest (formerly called North Central) regions increased by 0.2 percent and 4.0 percent, respectively, compared with 20.0 percent in the South and 23.9 percent in the West. These differences reflect the movement of people seeking new jobs or retiring and higher birth rates in some areas than others. Chart 2 shows the expected changes in State populations between 1980 and 2000 if the movement of people during that period is similar to the movement between 1970 and 1980.

The overall movement of U.S. population will be to the South and West. The West will continue to be the fast-

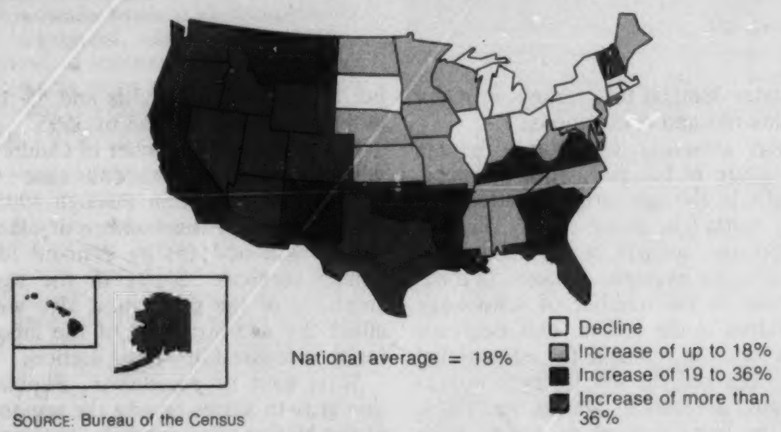
Chart 1.
The population will grow more slowly through the mid-1990's.



SOURCE: Bureau of the Census

Chart 2.
Changes in population will vary among the States.

Projected percent change in State populations, 1980 to 2000



SOURCE: Bureau of the Census

est growing region of the country, increasing about 45 percent between 1980 and 2000. In the South, the population will increase about 31 percent, with the largest absolute increase in population. The Midwest region is expected to increase only about 2 percent between 1980 and 1990, and to decline about 1 percent from 1990 to 2000. The population of the Northeast region will decline about 6 percent. By the year 2000, the West and the South will have about 60 percent of the Nation's population compared to about 52 percent in 1980.

The Northeast region will have the oldest age distribution; almost 15 percent of its population will be age 65 or older. The West will have the youngest age distribution; over 22 percent of the population will be under age 15, and about 45 percent will be between the ages of 15 and 44. The age distribution of the South and Midwest regions will be similar to the national average.

Geographic shifts in the population alter the demand for and supply of workers in local job markets. In areas with a growing population, for example, demand for public services and construction is likely to increase. However, more people looking for work could increase competition for jobs. Therefore, the areas with the fastest population growth may not necessarily offer the best job opportunities in every occupation. Because of population shifts, along with changes in demand for goods and services produced in an area, local employment opportunities in an occupation could differ greatly from national projections presented in the *Handbook*. Sources of information about local job market conditions can be found in the section "Where to Go for More Information."

Labor Force

The labor force is composed of people who are working and people who are looking for work. Population trends just discussed largely determine the growth and age structure of the labor force. Another significant factor is the level of education of the labor force.

Growth. In 1984, the civilian labor force—people with jobs and people looking for jobs—totaled about 114 million. The labor force will grow through the mid-1990's, but at a slower rate than in the 1970's and the first half of the 1980's (chart 3). Growth will be slower because the low birth rates during the 1960's and 1970's will result in fewer young people entering the labor force. By 1995, the labor force is projected to be about 129 million—an increase of about 14 percent from the 1984 level.

Through the mid-1990's, the chief cause of labor force growth will be the continued though slower rise in the number and proportion of women who seek jobs. Women will account for more than three-fifths of the labor force growth during 1984–95 (chart 4).

Age structure. Through the mid-1990's, the number of people age 16 to 24 in the work force is projected to decline (chart 5). Fewer young entrants into the labor force may ease competition for entry level jobs. In fact, employers may have increasing difficulty in finding young workers. The decline in the number of young workers could be particularly important to the Armed Forces—the single largest employer of people in this age group.

The number of people age 25 to 54 in the labor force is expected to increase considerably, from less than two-thirds of the labor force in 1984 to nearly three-fourths by 1995. The growing proportion of workers age 25 to 54 could result in higher productivity growth since workers in that age group generally have substantial work experience and tend to be the most productive.

The number of people age 55 and over in the labor force is projected to decline slightly, reflecting the trend to early retirement and the drop in the number of people age 55 to 65.

Education. Employers tend to hire the best qualified persons available. This does not mean that they always choose those applicants who have the most education. However, individuals planning for a career should be aware of the rising educational level of the work force. Between 1970 and 1984, for example, the proportion of the labor force age 18 to 64 with at least 1 year of college increased from 26 to 41 percent, while the proportion with 4 or more years of college increased from 13 to 22 percent (chart 6). The increase reflects both the retirement of older workers, many of whom had little formal education, and the entry into the work force of young people, who generally have a high level of formal education. Among workers age 25 to 34, for example, nearly half have completed at least 1 year of college and over a quarter had 4 or more years of college.

The disadvantage that less educated workers suffer when seeking jobs is clearly shown in their unemployment rate. In 1984, the unemployment rate among 20- to 24-year-olds with 1 to 3 years of high school was 26.7 percent. The rate for those with 4 years of high school was less than half that, 13.0 percent. The rates for those with 1 to 3 years of college and 4 or more years of college were only 7.8 and 4.9 percent, respectively. The connection between higher unemployment rates and low levels of education shows the importance of education in a job market that increasingly requires more formal training.

However, it is also important to note that a college degree no longer guarantees success in the job market. Between 1970 and 1984, employment of college graduates grew 127 percent. The proportion employed in professional, technical, and managerial occupations, however, declined because these occupations did not expand rapidly enough to absorb the growing supply of graduates. As a result, 1 out of 5 college graduates who entered the labor market between 1970 and 1984 took a job not usually requiring a degree. This oversupply of graduates is likely to continue through the mid-1990's. Not all occupations requiring a college degree will be overcrowded, however. Good opportunities will exist for systems analysts and engineers, for example.

Despite the generally competitive job market for college graduates, a degree is still needed for most high-paying and high-status jobs. Persons interested in occupations that require a college degree should not be discouraged from pursuing a career that they believe matches their interests and abilities, but they should be aware of job market conditions.

Economic, Technical, and Other Factors Affecting Employment

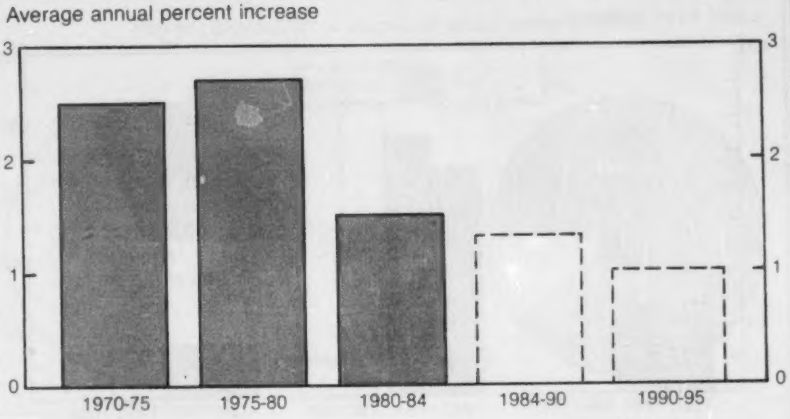
The previous two sections discussed trends in the population and the labor force that will affect employment opportunities. This section gives an overview of other factors that will affect the level of employment.

The number of jobs in particular industries and occupations depends in large part on the consumer, government, and business demand for goods and services produced by those industries and workers. Using a simple example, if people ate out more often, employment of cooks, waiters, and other restaurant workers would increase; employment of clerks and other grocery store workers would decline. In addition, employment in industries which produce restaurant equipment would grow; in industries that make grocery store equipment, employment would decline. The demand for smaller, more energy-efficient automobiles has prompted auto manufacturers to use more plastic, aluminum, and specialty steel and less of standard iron and steel. This shift has lowered the demand for products from the iron and steel manufacturing industry, the iron and metallurgical coal mining industries, and other industries that supply iron and steel manufacturers, so that employment in these industries has been adversely affected. At the same time, demand has increased for the products of the plastic, aluminum, and specialty steel industries and the industries that supply those manufacturers. Employment in those industries has benefited from the change.

As is clear from the first example, expansion or decline in industries affects growth in individual occupations differently because industries employ different mixes of workers (chart 7). Growth in manufacturing industries, for example, increases employment of production and material moving occupations, helpers, and laborers. In contrast, growth in the finance, insurance, and real estate industries increases employment of administrative, managerial, sales, and clerical workers.

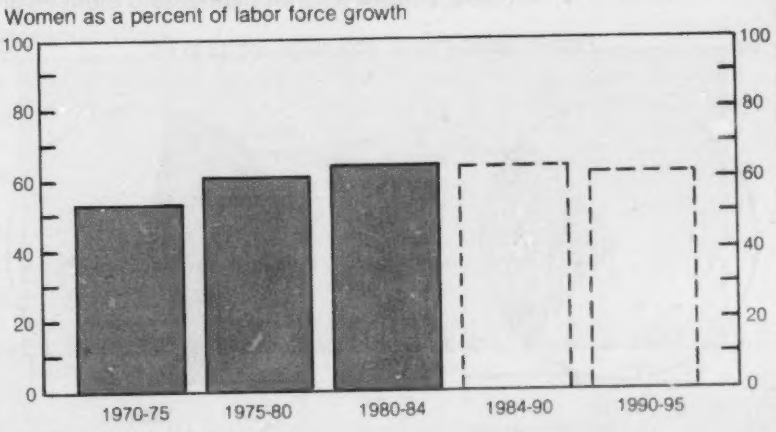
Changes in the manner in which goods and services are produced also affect occupational and industrial em-

Chart 3.
Labor force growth will slow through the mid-1990's.



SOURCE: Bureau of Labor Statistics

Chart 4.
Through the mid-1990's, women will account for over three-fifths of the growth in the labor force.

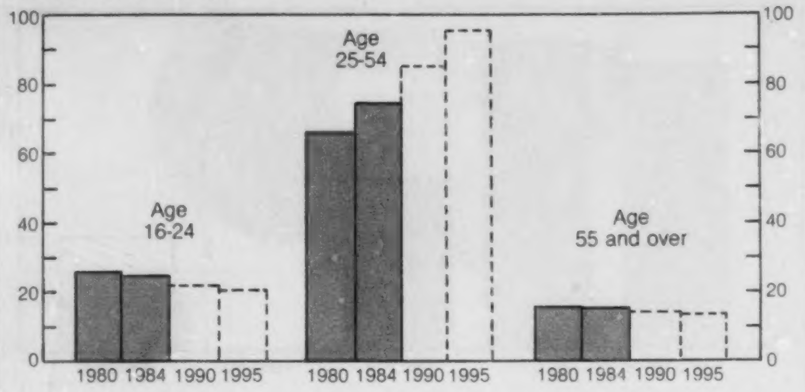


SOURCE: Bureau of Labor Statistics

Chart 5.

The number of workers in the prime working ages will grow dramatically through the mid-1990's.

Labor force (millions)



SOURCE: Bureau of Labor Statistics

ployment. Increasing automation in automobile manufacturing, for example, is one of the factors expected to limit growth of assemblers, welders, and other production occupations in that industry. The increasing use of word processing equipment will mean little or no growth of typists in most industries. However, the introduction of new technologies will probably increase employment of engineers, technicians, computer specialists, and repairers. The overall impact of technology will be to increase the amount of goods and services each worker can produce. Output of goods and services is expected to increase rapidly, however, so that employment should continue to increase in most industries and occupations.

Other factors affecting employment are the fiscal policies of the Federal Government, the monetary policies of the Federal Reserve Board, the level of imports, and the availability of energy. Using information on these and other factors, the Bureau of Labor Statistics has prepared three sets of projections of employment in industries and occupations. Referred to as the base case and low- and high-growth alternatives, the projections are based on differing assumptions concerning growth of the labor force, unemployment, monetary and fiscal policy, and other factors. Each provides a different set of estimates of employment in 1995.

The alternatives developed by the Bureau represent only three of many possible courses for the economy. Different assumptions would lead to different projections of the economy. For this reason, the alternatives should not be viewed as the bounds of employment growth; rather, they illustrate what might happen. Furthermore, unforeseen changes in spending patterns, in levels of imports and exports, or in technology, could radically alter the projections for individual industries and occupations.

A discussion of the assumptions and methods used to develop these projections can be found in an appendix beginning on page 489. The projections were presented in the November 1985 issue of the *Monthly Labor Review*. For ease of presentation, the discussions of projections and outlook information in the *Handbook* focus on the base case.

Employment Change

Employment is expected to increase from 106.8 million in 1984 to 122.8 million in 1995, or about 15 percent. This growth, while substantial, is much slower than growth during the previous 11-year period, for reasons discussed in the section on labor force growth. Employment change can be looked at in two ways: by industry and by occupation. The following two sections look at projected 1984–95 employment change from both perspectives.

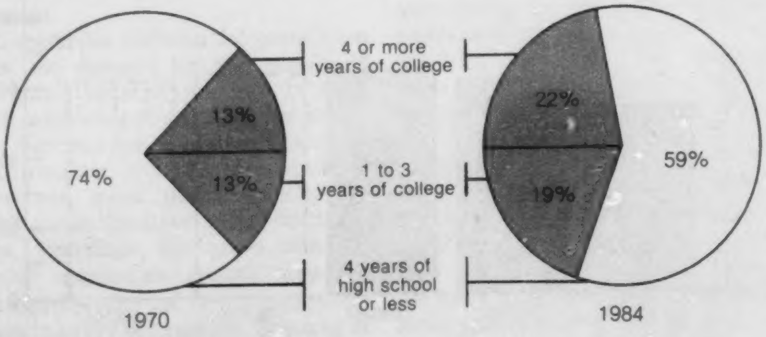
Industrial Profile

To discuss employment trends and projections in industries, it is useful to divide the economy into nine industrial sectors under two broad groups. These groups are goods-producing industries, which produce tangible products like apples, coal, and refrigerators, and service-producing industries, which produce intangibles such as health care, education, repair and maintenance, amusement and recreation, transportation, banking, and insurance. In 1984, over 7 of every 10 jobs were in industries that provide services. Industries that produce goods through farming, construction, mining, and manufacturing accounted for fewer than 3 of every 10 jobs.

Chart 6.

During the 1970's and early 1980's, the proportion of workers with a college background increased substantially.

Percent distribution of labor force age 18 to 64



SOURCE: Bureau of Labor Statistics

Service-Producing Industries. Employment in service-producing industries has been increasing faster than employment in goods-producing industries (chart 8). As incomes and living standards have risen, peoples' desires for services have grown more rapidly than for goods. In addition, goods-producing industries have been contracting out to service industries many rapidly growing activities they had done internally, such as cleaning and maintenance, engineering design, and accounting. Furthermore, imports of foreign-made goods have increased, limiting the growth of U.S. goods-producing industries. Imports of services have not increased as much.

Employment is expected to continue to increase much faster in service-producing industries than in goods-producing industries (chart 9). In fact, service-producing industries are projected to account for about 9 out of 10 new jobs between 1984 and 1995. Employment in these industries is expected to increase 18 percent, from 77.2 million in 1984 to 91.3 million in 1995. Growth will vary among industries within the group. The following paragraphs summarize recent trends and employment projections in the five industrial sectors that make up the service-producing industries.

Transportation, communications, and public utilities. Employment has increased in air transportation and transportation services, but has declined in railroads and water transportation since 1979. Even in the communications industries, where demand has increased greatly, technological innovations have limited employment growth.

Between 1984 and 1995, employment in transportation, communications, and public utilities is expected to rise 14 percent, from 5.6 million to 6.4 million. Rising demand for new telecommunications services, resulting from the increased use of computer systems and the divestiture of the telephone company, will make communications the most rapidly growing industry in the sector. Employment in communications industries is projected to grow by 17 percent, from 1.4 million to 1.6 million. More efficient communication equipment, however, will keep employment from rising as rapidly as output.

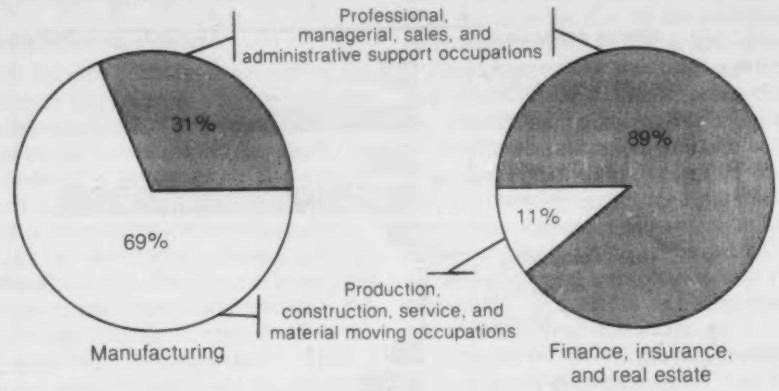
Although employment in railroads is expected to decline, it is expected to increase in other transportation industries such as air transportation, local transit, and trucking. However, deregulation will continue to have an impact in trucking, where a shift to self-employed truckers is expected, and in airlines, where a much slower rate of growth than in the past is projected. On the other hand, the transportation services industry (mostly travel agencies) will grow rapidly. Employment in transportation as a whole should rise 14 percent, from 3.2 million to 3.7 million.

Demand for electric power, gas utilities, and water and sanitary services will increase through the mid-1990's as population and industry grow. Employment in industries that deliver these services is expected to increase 13 percent, from 1.0 million to 1.2 million.

Trade. Both wholesale and retail trade employment have increased as the population has grown and as rising incomes have enabled people to buy a greater number and variety of goods. During the 1970's and early 1980's, employment in trade increased at about the same rate as in service-producing industries as a whole. Between 1984 and 1995, wholesale and retail trade employment is expected to grow 16 percent, from 24.3 million to

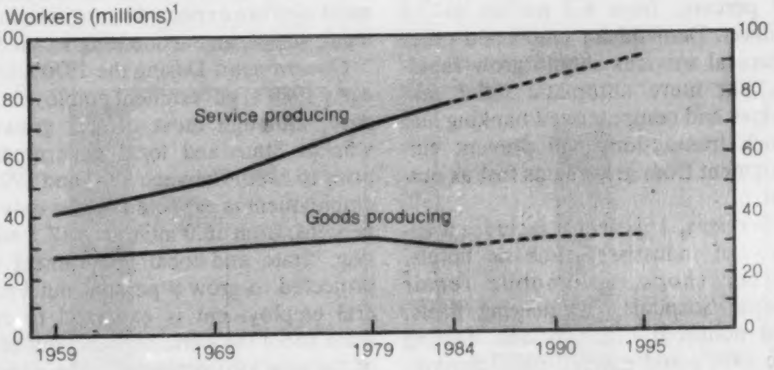
Chart 7.
Industries differ substantially in the kinds of workers they employ.

Percent distribution of wage and salary workers, 1984



SOURCE: Bureau of Labor Statistics

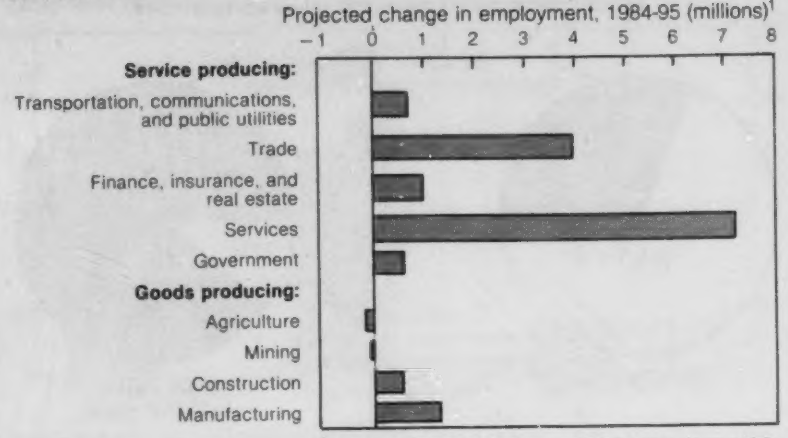
Chart 8.
Industries providing services will continue to employ many more prople than those providing goods



[1] Includes wage and salary workers, the self-employed, and unpaid family workers.

SOURCE: Bureau of Labor Statistics

Chart 9.
Through the mid-1990's, some industries will grow much faster than others.



SOURCE: Bureau of Labor Statistics

[1] Wage and salary employment except for agriculture, which includes self-employed and unpaid family workers.

28.3 million. Employment will rise despite the use of laborsaving innovations such as computerized inventory systems and automated warehouses.

The largest number of new jobs in the trade sector is projected to be in eating and drinking places. Large increases are also expected in department stores, grocery stores, and car dealerships. In wholesale trade, the largest increases will be in firms handling machinery, electrical goods, and motor vehicles.

Finance, insurance, and real estate. This was the second fastest growing service-producing sector during the 1970's and early 1980's as financial and banking needs mushroomed.

Between 1984 and 1995, employment in this sector is expected to rise 17 percent, from 6.3 million to 7.4 million. Demand for credit and other financial services should grow rapidly, but more automatic teller machines and computerized banking and stock transactions will prevent employment from growing as fast as output.

Services. This sector includes a variety of industries, such as hotels, barber shops, automobile repair shops, hospitals, engineering firms, and nonprofit organizations. During the 1970's and early 1980's, employment in this sector increased faster than in any other sector. Sharply rising demand for health care, data processing, and engineering and legal services were among the forces behind this growth.

From 1984 to 1995, employment in service industries is expected to increase 30 percent, from 23.4 million to 31.2 million, and provide more new jobs than any other sector. Business services, including data processing, temporary help supply agencies, and services to buildings, primarily cleaning, are expected to grow more rapidly and add more jobs than any other industry in the economy. Employment in health services also is expected to increase substantially, but cost containment measures are expected to restrict the rate of growth of health care industries despite increased demand generated by an aging population and by advances in medical technology. Large increases in employment also are expected in engineering, legal, social, and accounting services.

Government. During the 1970's and early 1980's, government employment rose, although most of this growth was in State and local government prior to 1980. Between 1984 and 1995, employment is expected to rise only 7 percent, from 16.0 million to 17.1 million. State and local government is projected to grow 9 percent but Federal employment is expected to remain about the same. About 3 out of 7 of the new jobs projected to be added in State and local governments will be in public education, which is projected to rise from 6.7 million in 1984 to 7.2 million in 1995. Employment in elementary schools is expected to rise faster than in high schools.

Goods-Producing Industries. Employment in these industries increased during the 1970's, but the 1980 and 1981–82 recessions caused a drop in employment. Although employment in these industries increased by 1984, it was still under the 1979 peak. Between 1984 and 1995, employment in goods-producing industries is expected to increase only 6 percent, from 29.6 million to 31.4 million, which is only slightly higher than employment in 1979. Significant variation in employment growth is expected among goods-producing industries.

Agriculture. The use of machinery, fertilizers, feeds, pesticides, and hybrid plants has made possible increased farm output with a smaller work force. Domestic demand for food will increase slowly through the mid-1990's. Worldwide demand for food will increase because of population growth, and U.S. food exports will increase through the next decade. Farm productivity, however, will continue to improve—although more slowly than in the past—and employment is expected to continue to decline even as production rises. Between 1984 and 1995, agricultural employment is projected to drop 7 percent, from 3.3 to 3.0 million jobs.

Mining. Employment in the mining sector increased rapidly from 1973 to 1981, primarily due to increased mining of coal in response to oil shortages. It then declined substantially due to recession, foreign competition for metals, and a drop in the price of oil which brought the oil and gas boom of the early 1980's to a halt.

Between 1984 and 1995, employment in the mining industry is expected to decline 3 percent, from 651,000 to 631,000. Employment in oil and gas extraction is expected to increase only 1 percent as domestic production levels off; employment in coal mining is expected to decline due to productivity improvements and expected slow growth in demand. Most other mining industries are expected to have decreases in employment because of import competition and improvements in mining technology.

Construction. Employment in construction dropped considerably between 1979 and 1982, as high interest rates and low economic activity limited new construction, but has since rebounded and now is higher than in 1979 because of lower interest rates and increased economic activity.

The construction industry is projected to benefit from an anticipated growth in investment, particularly after 1990. Between 1984 and 1995, employment in the construction sector is expected to increase 12 percent, from 5.9 to 6.6 million. Through the late 1980's, the demand for housing is expected to be strong as interest rates are projected to drop slowly and as the industry continues to recover from the low level of new residential construction during the 1980–82 recession years. During the early 1990's, the growth in households will slow and possibly limit the demand for new housing. Nonresidential construction is projected to recover from the recent oversupply of commercial office buildings and also to grow as factory modernization accelerates.

Manufacturing. Improved productivity and import competition caused a 1.6 million drop in manufacturing employment between 1979 and 1984, following a slight increase during the 1970's. Employment is expected to increase 7 percent, from 19.8 million in 1984 to 21.1 million in 1995 due to strong demand resulting from an expected capital spending boom and continued strong growth in defense expenditures. Only modest employment gains in manufacturing are expected because of the anticipated productivity increase from investment in high-technology capital equipment. Despite this growth, manufacturing employment in 1995 will still be slightly below the 1979 level. Several key manufacturing industries, such as automobile and steel manufacturing, are not expected to reach previous peak employment levels. On the other hand, the computer, materials handling equipment, and scientific and controlling instruments industries will be among the fastest growing industries.

Manufacturing is divided into two broad categories—durable goods manufacturing and nondurable goods manufacturing. Employment in durable goods manufacturing is expected to increase by 12 percent due to rising business, military, and consumer demand for computers, machinery, and electronic components. However, employment in nondurable goods manufacturing is projected to decline by 2 percent, reflecting the tendency of consumers to spend less of their budget on staples such as food and clothing as their income rises.

Occupational Profile

This section gives an overview of the changes expected in employment for 16 broad groups of occupations. These groups are based on the Standard Occupational Classification, the system used by all Federal agencies that collect occupational employment data.

In the following discussion, as throughout the *Handbook*, projected employment change in individual occupations usually is compared to the average for all occupations. Half a dozen phrases are used to describe the projected change in employment; they are explained in the box on page 4. It is important to remember that both the rate of growth and the size of the change in employment are important in analyzing the job outlook (chart 10).

Executive, administrative, and managerial occupations. In most of these occupations, employment is expected to increase about as fast as the average for all occupations. However, faster growth is expected for occupations in fast-growing industries. Employment of managers in the health industry, for example, is expected to increase much faster than the average. Employment of administrators and managers also should grow faster than the average in data processing services, credit and securities firms, automotive repairs, and social services. In contrast, managerial employment in government and education services is likely to grow more slowly than the average due to the anticipated modest growth of these industries.

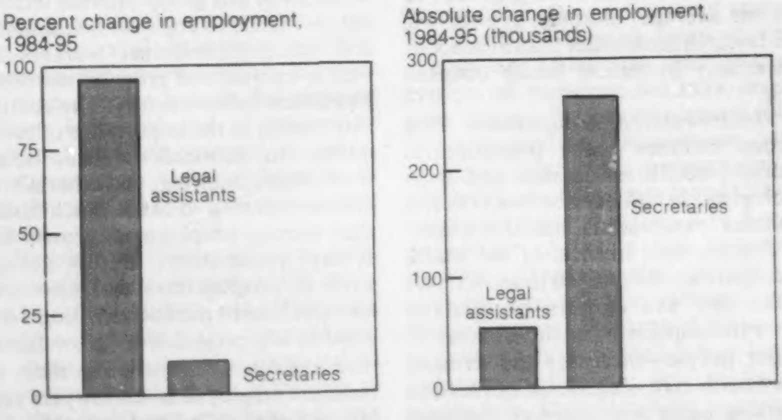
Employment of accountants and auditors will grow much faster than the average as managers rely more on accounting information to make business decisions. Employment of buyers, purchasing agents, and personnel specialists will increase about as fast as the average, while employment of construction and compliance and enforcement inspectors will increase more slowly than the average.

Because of the increasing number of people seeking managerial and administrative jobs and the increasing technical requirements in many of these occupations, experience, specialized training, or postbaccalaureate study will be needed for more of them. Familiarity with computers will be needed in more jobs as managers and administrators increasingly rely on computerized information systems.

Engineers, scientists, and related occupations. Employment in most of the occupations in this group is expected to increase as fast as or faster than the average; employment of engineers and systems analysts is expected to grow much faster than the average.

Increased military expenditures, growing demand for computers and other electronic equipment, and ex-

Chart 10.
Even though an occupation is expected to grow rapidly, it may provide fewer openings than a slower growing but larger occupation.



SOURCE: Bureau of Labor Statistics

pansion and automation in most areas of the economy are expected to lead to higher employment in engineering occupations. The growing application of computers will contribute to increased employment of systems analysts. Research to expand basic knowledge and to develop new technologies and products is expected to lead to higher employment in scientific occupations, although employment of scientists will grow more slowly than engineers.

Social science, social service, and related occupations. Employment in many of the occupations in this group is expected to grow about as fast as the average. However, due to the number of people interested in these fields, competition for jobs is expected in many occupations—especially for academic positions. Generally, prospects will be better for those with advanced degrees who seek work in applied fields. Competition also is likely for jobs as social and recreation workers in public and voluntary agencies as well as for salaried positions for lawyers.

Teachers, librarians, and counselors. Because of anticipated enrollment declines and an abundance of qualified jobseekers, competition is expected for college and university faculty. Only slow growth is expected in secondary school teaching.

Because elementary school enrollments are increasing, employment of elementary school teachers is expected to grow rapidly. Secondary school teachers, college faculty, and librarians in scientific and technical fields generally will face better job prospects.

Employment of vocational and educational counselors will grow as fast as the average, although growth will be faster in areas other than in schools, especially in mental health counseling.

Health-related occupations. This group includes health practitioners, nurses, health technicians and technologists, health service workers, dietitians, pharmacists, and therapists.

Employment in most of the health occupations is expected to grow faster than the average as population growth—especially in the number of older people—increases the demand for health care. Registered nurses and nursing aides and orderlies, because of the large size and anticipated growth of these occupations, will be among the occupations providing the most new jobs through the mid-1990's. Despite the anticipated growth in the health industry, physicians, dentists, chiropractors, and veterinarians seeking to establish practices can expect unprecedented competition due to the large number of newly trained practitioners entering those fields each year.

Pressure to contain costs, especially in hospitals, and technological advances will affect the projected rates of growth in many health-related occupations. For example, physician assistants, medical record technicians, and medical assistants will grow much faster than the average but automation of laboratory procedures will make for slower than average growth for medical and clinical laboratory technologists.

Writers, artists, and entertainers. This group includes reporters, writers, designers, public relations specialists, and performing artists. In most of these occupations, employment is expected to increase as fast as the average for all occupations. The continued growth of advertising, public relations, print and broadcast communications, and entertainment will spur employment growth.

Stiff competition for jobs in these occupations is likely, due to the large numbers of people they attract. Talent and personal drive will continue to be extremely important for success in these occupations. Within individual occupations, some areas will offer better job prospects. The best prospects for writers and editors, for example, will be in technical writing and in business and trade publications.

Technologists and technicians. Workers in this group provide technical assistance to engineers, scientists, and other professional workers as well as operate and program technical equipment independently. The continued growth in the importance of technology to national defense, office work, manufacturing, and other activities is expected to cause much faster than average employment growth for several occupations in this group, such as programmers and electrical and electronics technicians. Legal assistants are projected to grow faster than any other occupation as more of them are employed to aid lawyers and because of the expected growth in the demand for legal services.

Employment growth in some of the occupations will be limited by changes in technology. Employment of drafters is expected to increase much more slowly than the demand for drafting services because of productivity improvements realized by the use of computer-aided design equipment. Similarly, little or no change in the employment of air traffic controllers is expected due to the automation of air traffic control equipment.

Marketing and sales occupations. Employment of travel agents, security sales workers, and real estate agents is expected to grow faster or much faster than the average due to anticipated growth of the industries in which these workers are employed.

Many part-time and full-time job openings are expected for cashiers and retail trade sales workers due to the large size, high turnover, and expected employment growth in these occupations. Higher paying sales occupations, such as insurance agent and real estate agent, tend to be more competitive than retail sales occupations. Well-trained, ambitious people who enjoy selling will have the best chance for success.

Administrative support occupations, including clerical. Workers in this group prepare and record letters and other documents; collect accounts; gather and distribute information; operate office machines; and handle other tasks that help run businesses, government agencies, and other organizations. The increase in office automation systems will limit employment opportunities in some administrative support occupations. Changes in organizational practices also will affect employment for some of these occupations. Despite a growing volume of mail, little change is expected in the employment of mail carriers because of improved routing programs and more centralized mail delivery. However, despite the projected slow growth, several occupations in this group will provide many full- and part-time job openings due to their large size and high turnover. These include bank tellers, bookkeepers and accounting clerks, secretaries, shipping and receiving clerks, and typists.

Some administrative support occupations will enjoy faster or much faster than average employment growth. Employment of computer operators and peripheral equipment operators, for example, is expected to grow much faster than the average due to the increased use of computer systems.

Service occupations. This group includes a wide range of workers in protective, food and beverage preparation, cleaning, and personal services and is expected to account for more job growth than any other broad group. Among the protective service occupations, correction officers are expected to have much faster than average growth because of the increasing number of inmates, and guards are expected to have faster than average growth because of concern over crime and vandalism. Employment of police officers and firefighters is expected to increase about as fast as the average.

Rising incomes and the growing number of men and women who combine family responsibilities and a job are expected to contribute to faster than average employment growth among food and beverage preparation and service occupations such as bartenders, cooks, and waiters/waitresses. Due to the large size, high turnover, and growth of these occupations, full- and part-time job openings will be plentiful.

Agricultural and forestry occupations. Demand for food, fiber, and wood is expected to increase as the world population grows. The development and use of more productive farming and forestry methods, however, is expected to result in declining employment in most agricultural and forestry occupations.

Mechanics and repairers. These workers adjust, maintain, and repair automobiles, industrial equipment, computers, and many other types of machinery. Employment in most of these occupations is expected to grow about as fast as the average due to the greater use of machines throughout the economy. In some, employment will increase faster than the average. The increased use of computers and advanced office machinery, for example, will make employment of computer service technicians and office machine repairers grow much faster than the average. However, more reliable, easy-to-service machinery will limit employment growth for some mechanic and repairer occupations, such as communications equipment mechanics.

Construction occupations. Workers in this group are expected to experience average employment growth between 1984 and 1995. A rapid rise in spending for new industrial plants and an increase in the number of households are factors expected to lead to more new construction. Alteration and modernization of existing structures, as well as the need for maintenance and repair on highway systems, dams, and bridges, also will contribute to increased construction activity. However, the construction industry is very sensitive to changes in the Nation's economy, and employment in construction occupations drops sharply during recessions.

Production occupations. Workers in these occupations perform tasks involved in the production of goods. They set up, adjust, operate, and tend machinery and equipment, and use handtools and hand-held power tools to fabricate and assemble products. More efficient production techniques such as computer-aided manufacturing and the increased use of lasers and industrial robots will prevent employment in many production occupations from rising as rapidly as the output of goods. However, there will still be many openings in this group because of its large size.

Many production occupations are sensitive to changes in the economy. When factory orders decline during economic downturns, workers may experience shortened workweeks, layoffs, and plant closings.

Transportation and material moving occupations. Workers in this group operate the equipment used to move people and materials. An increase in demand for transport services is expected to result in average employment growth for truckdrivers and faster than average growth for airplane pilots. Increased use of automated material handling systems, however, is expected to cause a decrease in employment of industrial truck operators.

Handlers, equipment cleaners, helpers, and laborers. Workers in this group assist skilled workers and perform the routine unskilled tasks. Employment in these occupations is expected to grow more slowly than the average as routine tasks are mechanized, but jobs in these occupations generally are expected to be plentiful due to high turnover. However, economic downturns can lower the number of openings substantially. This is particularly true for construction laborers and other workers in industries that are sensitive to changes in the Nation's economy.

Since the employment prospects for individual occupations within each of the 16 groups differ, it is important to check the outlook for each occupation that interests you. More detailed statistics on employment, replacement needs, and educational and training program completions are presented in *Occupational Projections and Training Data, 1986 Edition,* BLS Bulletin 2251, a companion volume to the *Handbook.*

Replacement Needs

Most discussions of future job opportunities focus on the employment growth in industries and occupations. Since the faster growing industries and occupations generally offer better opportunities for employment and advancement than slow-growing ones, employment growth is a good gauge of job outlook. Another element in the employment outlook, however, is replacement needs. Replacement openings occur as people leave occupations. Some transfer to other occupations as a step up the career ladder or to change careers. Some stop working, return to school, assume household responsibilities, or retire.

Through the mid-1990's, most jobs will become available as the result of replacement needs. Among occupations, however, the number of replacement jobs and the proportion of total job openings made up by replacement needs will vary significantly. Size, the earnings and status, the length of training required, the average age of workers, and the proportion of part-time workers determine the number of replacement jobs in an occupation. Occupations with the most replacement openings generally are large, with low pay and status, low training requirements, and a high proportion of young and part-time workers. Examples are: File clerks, cashiers, construction laborers, and stock handlers. Workers in these occupations who lose their job or leave voluntarily often are able to find a similar job. They also have not spent much money or time in training for their jobs, so there is limited incentive to stay in such occupations. Occupations with low training requirements often attract workers with limited attachment to the labor force, such as young people working part time.

The occupations with relatively few replacement openings, on the other hand, are ones with high pay and status, lengthy training requirements, and a high proportion of prime working age, full-time workers. Among these occupations are architects, dentists, and dental laboratory technicians. Workers in these occupations generally have spent several years acquiring training that often is not applicable to other occupations. These workers enjoy good pay and high status, but would find it difficult to change to other high-paying occupations without extensive retraining.

When considering replacement needs, it is important to note, first, that occupations with little or no employment growth or slower than average growth can still offer many job openings. Second, in many occupations with a large number of replacement openings, the pay and status are low. Many of the available jobs are only part-time positions. These occupations, therefore, may not be suitable for a person planning a long-term career, despite the large number of openings. More information about replacement needs is available in *Occupational Projections and Training Data*.

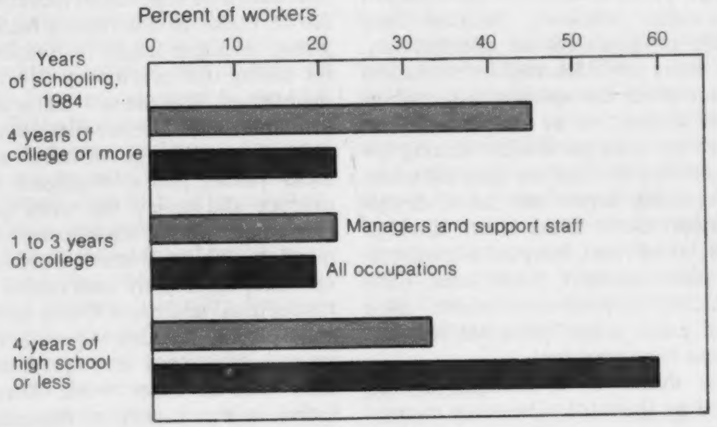
Executive, Administrative, and Managerial Occupations

Executives, administrators, managers, and their support staff are found in every organization. They establish goals, direct operations, and control major activities of their organizations. As a group, these workers are older, more experienced, more highly trained and, consequently, more highly paid than most other workers. In 1984, the proportion of these workers with 4 years or more of college was more than twice that of the total work force; and on the average their salaries were more than 50 percent higher than that of the total work force.

Executives, administrators, and managers must rapidly assess large amounts of information prepared by their support staff. For example, the chief executive officer may base a policy decision upon economic reports developed by budget specialists. Financial managers analyze data meticulously summarized by accountants. Personnel managers monitor information on staffing patterns compiled by personnel specialists. Marketing and sales executives develop strategies to market their firms' products based upon information furnished by buyers.

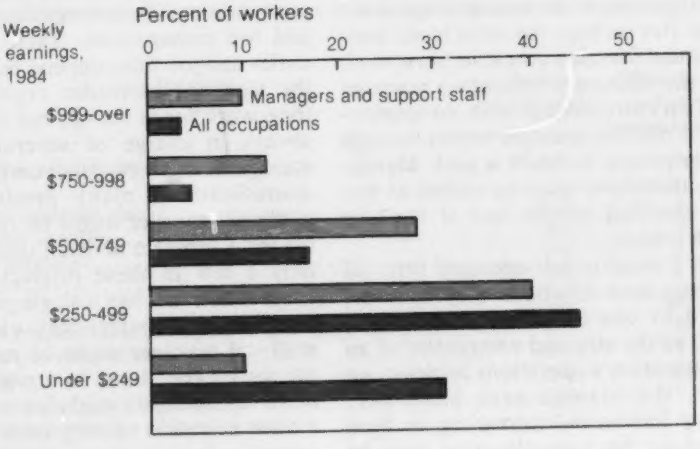
Detailed information about the nature of the work, working conditions, employment, training requirements, job outlook, and earnings for a number of executive, administrative, managerial, and support occupations appears in the following *Handbook* statements.

Managers and their support staff have much more formal education than most other workers.



SOURCE: Bureau of Labor Statistics

Managers and their support staff have much higher earnings than most other full-time workers.



SOURCE: Bureau of Labor Statistics

Managers and Administrators

Nature of the Work

Managers and administrators are needed in every organization. They plan, organize, direct, and control the organization's major functions. Some workers who are occasionally referred to as managers are excluded from this category, for example, supervisors of blue-collar workers, because they rarely set goals for an organization. The many job titles used for managers reflect either the specific responsibility of a position or the industry in which the manager works. Among the numerous job titles are account executive, cable supervisor, chief design engineer, clerk of the court, director of social services, hospital administrator, plant manager, postmaster, publisher, refinery superintendent, sales coordinator, school principal, treasurer, and vice president.

The duties of a manager are as varied as their titles because managers oversee many different activities, such as designing the product that an organization will offer, manufacturing it, and marketing it. Financial control—that is, keeping track of an organization's income and expenses—is another important management function. But perhaps the most basic management function concerns personnel, for the difference between a manager and an entrepreneur with no employees is that the manager works through other people to reach a goal. Managers, therefore, must be skilled at hiring qualified people and at working with others.

In a small owner-operated firm, all management functions may be exercised by one individual—the owner. But, as the size and complexity of an organization's operations increase, so does the management hierarchy. Many functions—accounting or legal services, for example—that may be contracted out by small firms are often performed internally by large corporations. Giant corporations, such as those found in the automobile and oil industries, contain several layers of management, which are generally grouped in three levels—supervisory, middle, and top.

Supervisory or junior managers plan, schedule, and supervise the day-to-day work of employees. For example, a junior manager in a department store might supervise several sales clerks, keep records of inventory and sales, and be responsible for insuring that adequate supplies of merchandise are on hand. In a ceramics factory, a junior manager might be responsible for seeing that machinery is properly maintained, that the raw materials are available, and that production schedules are met. In a government or business office, junior managers might oversee and review the work of professionals. Junior managers must be familiar with their firm's products or services, thoroughly understand work procedures, and have strong interpersonal skills. Besides supervisory responsibilities, they may spend part of their time on other work. They are found in every sort of organization directing every kind of activity, such as accounting, data processing, inspection, maintenance, marketing, personnel, research, sales, security, and shipping.

Midlevel managers hold intermediary positions between supervisory and top management. Their specific duties and job titles depend largely on the way the particular organization they work for is set up, but they are always in charge of several junior managers. In a very large corporation manufacturing many products, a midlevel manager might be responsible for a separate division that makes only a few of these products. In a corporation that has a single purpose, such as a supermarket chain, a midlevel manager might be responsible for all the stores in a region. Or midlevel managers might be responsible for a specific activity such as personnel, sales, service, or production.

Top-level managers include members of the board of directors, the chief executive officer—who may be the president or the board chairman—and the vice presidents for major administrative units, such as marketing or financial operations. These executives establish the objectives of the organization and chart its future course. They must analyze and evaluate large amounts of information to gauge the possible impact on their organization of economic, political, and social trends; technological change; and competition. They also coordinate the activities of various administrative units within their organizations and maintain lines of communication with middle managers.

Working Conditions

Like their duties and job titles, the working conditions of managers vary widely depending upon their position, their employer, and their industry. In a large corporation, a top-level manager might have a lavish office and a private secretary, whereas a production-line manager might have a simple office and use a secretarial pool. Most work a standard 8-hour day and 5-day week, but many do not. Some, like those in newspaper publishing, regularly work the night shift. Others, like hospital administrators, are on call 24 hours a day to deal with emergencies. And almost all managers are expected to work overtime when necessary. Other working conditions also differ greatly from job to job. For example, managers in the construction industry work outdoors a lot, while those responsible for a large region travel a great deal.

The pace of work also varies. In the radio and television broadcasting industry, managers are subject to constant deadlines. For hotel managers, checkout time can be particularly hectic. In retail trade establishments, seasonal changes in activity are pronounced. In the drug manufacturing industry, research projects may be long term, scheduled for completion months or even years in the future.

Naturally, the degree to which managers work with other people also depends on their particular job. Some, like those in restaurants, automotive service departments, and social service agencies, are in constant contact with the public. Managers associated with research and development activities, on the other hand, may rarely deal with people outside their office.

Employment

Managers held about 8.8 million jobs in 1984, nearly 90 percent of which were salaried positions. In most industries, the proportion of managers is roughly the same as it is in the economy as a whole, about 8 percent. The finance, insurance, and real estate industry group, however, has a relatively high proportion of managers (17 percent); and the agriculture, forestry, and fisheries group has a relatively low one (2 percent).

Generally, large industries are also large employers of managers. The 20 industries listed in table 1 employed over 60 percent of all salaried managers in 1984.

Self-employment is higher among managers than most occupations. Many self-employed managers work in retail trade—an industry characterized by a large number of relatively small establishments.

Training, Other Qualifications, and Advancement

Management is not usually an entry level function. Some people enter management training programs after completing college, but most people who become managers start their careers in other occupations. School administrators often begin as teachers, treasurers begin as accountants, and store managers start out as sales workers.

To be considered for management positions, workers must first prove themselves in their current job. In evaluating candidates, superiors look for determination, confidence, innovativeness, high motivation, and managerial attributes, such as the ability to make sound decisions, to organize and coordinate work efficiently, and to establish good personal relations with other workers.

Potential junior managers may be given occasional supervisory assignments and, shortly before or after assuming full-time supervisory duties, may participate in management seminars and training courses—offered by industry and management associations, consulting firms, and institutions of higher education—lasting from 1 day to several months. Training may also include rotational assignments to other administrative units, plants, or overseas posts; service on boards and committees; and serving as assistants to higher level managers.

A college education is more important for managers than for most other occupations. In 1984, over 40 percent of all salaried managers and administrators had completed 4 years or more of college—roughly double the proportion for all occupations. However, there is considerable variation in the median years of schooling among managerial occupations. For example, administrators in education and related fields had completed over 18 years of schooling while property and real estate managers had completed only 13.2 years compared to the 12.8 years for all occupations in 1984. Many managers undergo additional qualifying training. For example, in 1984, about one-fifth of marketing, advertising, and public relations managers and of medical and health managers said that they needed formal company training to qualify for their current job. Nearly one-half of financial managers and marketing, advertising, and public relations managers said that informal on-the-job training was required.

Advancement invariably depends upon successful performance. However, in highly technical activities such as engineering, data processing, and complex manufacturing operations, a graduate degree in business management can enhance one's chances for promotion to top-level management positions. Graduates with a master's degree in business administration from a prestigious school can often enter a wide range of industries and many, especially those with previous managerial experience, move up the management hierarchy soon after employment in their new position.

Continuing training is also important. For example, in 1984, 1 out of 3 public administration officials said they took formal company training to improve their skills; over 1 out of 4 took informal on-the-job training. Industry sources indicate that many top-level managers complete formal academic refresher or "catch-up" programs of about a year's duration at least two or three times during their management careers.

Job Outlook

Employment of salaried managers and administrators is expected to increase faster than the average for all occupations through the mid-1990's as business operations become more com-

Table 1. Wage and salary employment of managers in selected industries, 1984

Industry	Number (thousands)	Percent of industry employment
Total, all industries	7,851	8
Eating and drinking places	415	8
Educational services	395	5
Business services	375	9
Health services	336	5
Banking	309	18
Local government, except education and hospitals	275	8
Miscellaneous retail stores	269	13
Food stores	256	10
Wholesale trade, durable goods	235	7
Special trade contractors (construction)	232	10
General merchandise stores	203	9
Membership organizations	195	13
Real estate	185	17
Federal Government	171	8
Apparel and accessories stores	169	17
Automotive dealers and gasoline service stations	168	9
Machinery manufacturing, except electrical	163	7
General contractors and operative builders (construction)	162	14
Communications	161	12
Insurance carriers	151	12

SOURCE: Bureau of Labor Statistics.

plex. On the other hand, the number of self-employed managers is expected to decline as large enterprises and chain operations increasingly dominate business activity.

The projected change in employment varies greatly among managerial occupations. The employment of health services administrators is expected to increase much faster than average, as the health industry expands and health services management becomes more complex. Particularly strong demand will arise from the growth in health maintenance organizations, group medical practices, and other health care facilities such as emergency centers, surgicenters, and rehabilitation centers for patients not requiring the full spectrum of medical services offered by hospitals. In addition, there will be great pressure to expand skilled nursing and personal care facilities to accommodate the large increase in the number of senior citizens. Faster than average growth is expected in the employment of bank officers and managers as bank services expand in volume and complexity.

Employment of elementary and secondary school principals and assistants is expected to increase more slowly than the average, since the school-age population is projected to increase only modestly by the mid-1990's. The employment of postmasters and mail superintendents is also expected to increase more slowly than the average, as no significant increase in the number of post offices is expected.

Employment of managers generally changes along with employment in the industries in which they work. Much faster than average growth is expected in the employment of managers in many service industries—for example, business services, including computer and data processing as well as personnel supply services; miscellaneous services, including engineering, architectural, and surveying as well as accounting, auditing, and bookkeeping services; and social services, including residential care, individual and family social services, and job training and vocational rehabilitation services.

Industries in which faster than average growth in the employment of managers is expected include wholesale trade in nondurable goods; food stores; electrical and electronic machinery and equipment manufacturing; apparel and accessories stores; and State government, except education and hospitals.

Industries in which slower than average growth in the employment of managers is expected include the Federal Government and mining. Declines are expected in the employment of managers in some manufacturing industries—for example, food products and apparel and textile products.

Earnings

Managers tend to earn more than workers in other occupations. In 1984, median annual earnings of all full-time managers and administrators, excluding self-employed, were over $27,400—compared to $17,000 for all occupations. The middle 50 percent earned between $18,000 and $40,000. More than 12 percent—over 4 times the proportion for all workers—earned $52,000 or more.

Earnings vary widely by occupation, employer, and level of responsibility. Median annual earnings of property and real estate managers were $16,900 in 1984, whereas marketing, advertising, and public relations managers earned $31,400. As in most fields, large employers tend to pay higher salaries than small employers, and earnings are higher in major metropolitan areas than in rural areas.

Management trainees may start at salaries not much higher than those of workers they supervise, whereas salaries of executives may be several times larger. Top-level managers in large corporations—among the highest paid workers in the country—can earn 10 times as much as their counterparts in small firms. A small number of corporate executives earn over $1 million a year.

Most managers in the private sector receive additional compensation in the form of bonuses, stock awards, and cash-equivalent fringe benefits such as company-paid insurance premiums and use of company cars.

Sources of Additional Information

General information about managerial functions, training programs, and career development is available from:

American Management Association, Management Information Service, 135 West 50th St., New York, N.Y. 10020.

National Management Association, 2210 Arbor Blvd., Dayton, Ohio 45439.

Specific information may be obtained from the national organizations listed under a number of headings—administration, administrators, directors, executives, management, managers, superintendents, and supervisors—in various encyclopedias or directories of associations, available in public libraries.

For information on educational institutions offering a specialization in business and management, consult directories of institutions of higher learning, available in public libraries.

Consult the *Dictionary of Occupational Titles*, Fourth Edition, 1977 (U.S. Department of Labor, Employment and Training Administration), for a detailed description of various managerial jobs. Consult a number of headings—administrator, director, executive, manager, superintendent, and supervisor. A copy of this publication should be available in most public libraries.

Bank Officers and Managers

(D.O.T. 161.117-018; 186.117-014, -038, -054, -066, -070, -078; .167-022, -026, -054; and 189.117-038)

Nature of the Work

Practically every banking institution—whether commercial bank, savings and loan association, or personal credit institution—has one or more vice presidents acting as general managers who coordinate the activities of the institution's departments or regional offices, and financial managers who oversee the activities of their branches. Most have a controller or cashier who, unlike cashiers in stores and other businesses, is an executive officer generally responsible for all bank property. Large banks also may have treasurers and other officers to oversee several departments.

Each department is headed by a highly trained and experienced manager. Risk and insurance managers establish and oversee programs to control and minimize risks and losses that may arise from financial transactions undertaken by the institution. Credit card operations managers establish credit rating criteria, determine credit ceilings, and monitor their institution's extension of credit. Reserve officers review their institution's financial statements and direct the purchase and sale of bonds and other securities to maintain the asset-liability ratio required by law. User representatives in international accounting develop integrated international financial and accounting systems for the banking transactions of multinational organizations. A working knowledge of the financial systems of foreign countries is essential.

Bank officers make decisions within a framework of existing laws and regulations and policy set by the board of directors. They must have a broad knowledge of business activities and also detailed knowledge of industries allied to banking, such as insurance, real estate, and securities. With growing competition, promotion of an expanding variety of financial services offered by banking institutions is an increasingly important function of bank managers. Besides supervising financial services, officers advise individuals and businesses and participate in community projects.

Working Conditions

Since a great deal of bank business depends on customers' impressions, officers and managers are provided attractive, comfortable offices and are encouraged to dress conservatively. Bank officers and managers typically work at least 40 hours a week. However, attending civic functions, keeping abreast of community developments, establishing and maintaining business contacts, participating in trade association meetings, and similar activities may occasionally require overtime work.

Employment

Bank officers and managers held about 453,000 jobs in 1984. The following tabulation presents the distribution of wage and salary jobs by type of banking or credit institution.

Banking	309,000
Commercial and stock savings banks	282,000
Mutual savings banks	11,000
Federal Reserve banks	2,000
Trust companies, nondeposit	1,000
Establishments closely related to banks	12,000
Credit agencies other than banks	144,000
Savings and loan associations	63,000
Personal credit institutions	45,000
Mortgage bankers and brokers	22,000
Business credit institutions	9,000
Agricultural credit institutions	5,000
Rediscount and financing institutions	1,000

Bank officers confirm customers' credit eligibility.

Training, Other Qualifications, and Advancement

Many bank management positions are filled by promoting technically skilled personnel—for example, accountants, credit analysts, and loan officers—or outstanding bank clerks or tellers who have demonstrated the potential for increased responsibilities. More positions are being filled by management trainees with a college education. A business administration major in finance or a liberal arts curriculum, including accounting, economics, commercial law, political science, and statistics, serves as excellent preparation for officer-trainee positions. A Master of Business Administration (MBA) in addition to a social science bachelor's degree, which some employers prefer, may provide an even stronger educational foundation. However, banks do hire people with diverse backgrounds such as chemical engineering, nuclear physics, and forestry to meet the needs of the complex, high-technology industries with which they deal.

Persons interested in becoming bank officers should like to work independently and to analyze detailed information. The ability to communicate, both orally and in writing, is important. They also need tact and good judgment to counsel customers and supervise employees.

In small banks, where the number of positions is limited, advancement to a management position may come slowly. In large banks that have special training programs, promotions may occur more quickly. For a senior position, however, an employee usually needs many years of experience.

Although experience, ability, and leadership are emphasized for promotion, advancement may be accelerated by special study. Banks often provide opportunities for workers to broaden their knowledge and skills. Many banks encourage employees to take courses at local colleges and universities. In addition, banking associations, often in cooperation with colleges and universities, sponsor numerous national or local training programs for bank officers. Their schools, located throughout the country, each deal with a different phase of banking. Persons enrolled prepare extensively at home, then attend annual sessions on subjects such as commercial lending, installment credit, international banking, corporate cash management, and bank technology. Banks also sponsor annual seminars and conferences and provide textbooks and other educational materials. Many banks pay all or part of the costs for those who successfully complete courses. (See the statement on bank tellers elsewhere in the *Handbook.*)

Bank operations have been revolutionized by technological improvements in computers and data processing equipment. Knowledge of their applications is important to upgrade managerial skills and to enhance advancement opportunities.

Because banking is an essential part of business, well-trained, experienced managers may transfer to closely related positions in other areas of finance or to positions within other industries, such as manufacturing, that need individuals with banking experience.

Job Outlook

Employment of bank officers is expected to increase faster than the average for all occupations through the mid-1990's. Expanded financial services offered by banks will spur demand for bank managers to provide sound management and effective quality control. Although bank officers and managers exhibit a relatively strong attachment to their occupation, most job openings will result from the need to replace those who transfer to other fields, retire, or leave the occupation for other reasons.

Because of the increasing number of qualified applicants, competition for bank managerial positions is expected to stiffen. Familiarity with other financial services—for example, insurance or securities—and with computers and data processing systems may enhance one's chances for employment. Once employed, managers and officers are likely to work year round, even during periods of slow economic activity, because cyclical swings in the economy seem to have little immediate effect on banking activities.

Earnings

Officer trainees with a bachelor's degree generally earned between $13,200 and $22,800 a year in 1984. Those with master's degrees generally started at higher salaries. Graduates with a Master of Business Administration were offered starting salaries of $21,600 to $42,000 a year in 1984.

Salaries of bank officers averaged $28,600 in 1984. The salary level depends upon the particular position and the size and location of the bank. For managers, as well as for other bank employees, earnings are likely to be lower in small towns than in big cities. The top 10 percent of all bank officers earned over $52,000 a year in 1984.

Related Occupations

Bank officers and managers combine formal schooling with experience in one or more areas of banking—such as lending, credit operations, or risk and loss control—to provide services for customers. Other occupations which require similar training and ability include accountants and auditors, budget officers, credit analysts, securities consultants, and underwriters.

Sources of Additional Information

General information about banking occupations, training opportunities, and the banking industry itself is available from:

American Bankers Association, 1120 Connecticut Ave. NW., Washington, D.C. 20036.

Bank Administration Institute, 60 Gould Center, Rolling Meadows, Ill. 60008.

National Association of Bank Women, Inc., National Office, 500 N. Michigan Ave., Chicago, Ill. 60611.

The Institute of Financial Education, 111 E. Wacker Dr., Chicago, Ill. 60601.

Information on careers with the Federal Reserve System is available from:

Board of Governors, The Federal Reserve System, Personnel Division, Washington, D.C. 20551, or from the personnel department of the Federal Reserve bank serving each geographic area.

State bankers' associations can furnish specific information about job opportunities in their State. Or write directly to a particular bank to inquire about job openings. For the names and addresses of banks, savings, and related institutions, as well as the names of their principal officers, consult one of the following directories.

The American Bank Directory (Norcross, Ga., McFadden Business Publications).

Polk's World Bank Directory (Nashville, R.L. Polk & Co.).

The U.S. Savings and Loan Directory (Chicago, Rand McNally & Co.).

Health Services Managers

(D.O.T. 074.131; 075.117-014, -022, -026, and -030; 079.117-010, .131, .137, and .167-014; 161.117-018; 162.117-014 and -022; 164.117-010; 165.117-010; 166.117-010 and -018, .167-018, -026, -030, and -050; 169.167-030 and -034; 186.117-014 and -066; 187.117-010, -018, -058, and -062, .167-034, -038, -046, -090, -106 and -194; 189.177-014, .167-022, -030, and -050; and 195.167.038)

Nature of the Work

Effective management of health care organizations, and of the considerable resources at their disposal, requires competent managers. Like their counterparts in any organization, health services managers are responsible for facilities, services, programs, staff, budgets, and relations with other organizations.

Health services manager is an inclusive term for individuals in many different positions who plan, organize, and coordinate the delivery of care. Hospitals provide nearly half the jobs in this field. Among the other organizations that employ health services managers are clinics, health maintenance organizations (HMO's), nursing homes, home health agencies, rehabilitation centers, and psychiatric facilities; surgicenters, urgent care centers, diagnostic imaging centers, and other ambulatory care facilities; and offices of doctors, dentists, and other practitioners.

The job of managing a health facility has become highly complex due to the rapid pace of change in medical technology and the emergence of dozens of specialty health professions, in addition to significant changes in consumer expectations, business practices, and health care financing. As a result, the need for professional managers continues to grow.

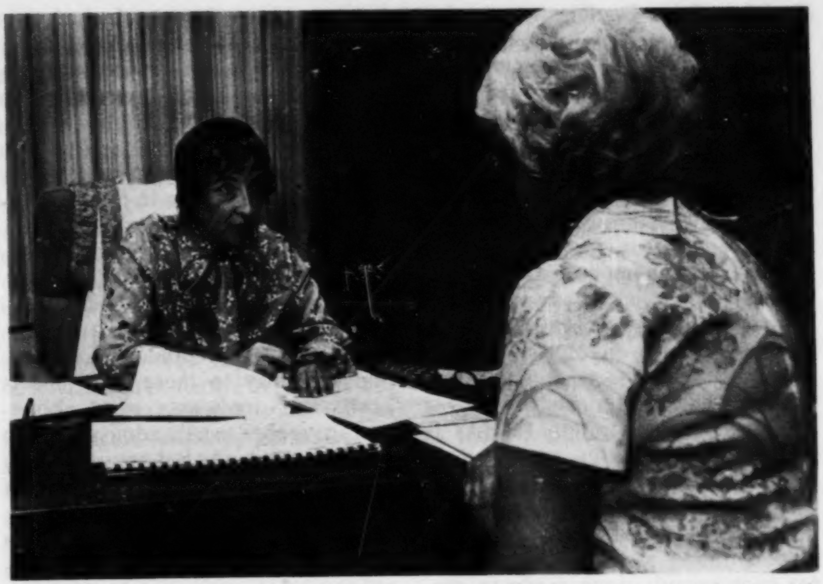
Also contributing to the need for professional management is the extensive oversight and scrutiny to which many health facilities are subject. Both past performance and plans for the future are subject to review by a variety of groups and organizations, including consumer groups, government agencies, professional oversight bodies, business coalitions, and even the courts. Preparing for inspection visits by observers from regulatory bodies and submitting appropriate records and documentation can be time consuming as well as technically demanding.

Three functional levels of administration are found in hospitals and other large health care settings—executive, internal management, and specialized staff. The chief executive officer provides overall management direction, but also is concerned with community outreach, planning, policymaking, response to government agencies and regulations, and negotiating. The job often includes speaking before civic groups, promoting public participation in health programs, and coordinating the activities of the organization with those of government or community agencies. Institutional planning is an increasingly important responsibility for chief administrators, who must assess the need for services, personnel, facilities, and equipment and recommend such changes as shutting down a maternity ward, for example, or opening an outpatient clinic. Chief administrators need leadership ability as well as technical skills in order to respond effectively to the community's requirements for health care while, at the same time, satisfying demand for financial viability, cost containment, and public and professional accountability.

Day-to-day management, particularly in large facilities, may be the responsibility of one or more associate or assistant administrators, who work with service unit managers and staff specialists. Depending on the size of the organization, associate or assistant administrators may be responsible for budget preparation and finance; personnel administration and in-service training; information management; or coordination of the activities of the medical, nursing, physical plant, and other operating departments.

As the health care system becomes more complex, specialists in financial management, marketing, strategic planning, systems analysis, and labor relations will need to be hired.

Although managers in hospitals and nursing homes are both responsible for the efficient operation of their facilities, their day-to-day duties differ markedly. Hospitals are complex in structure, housing a great many departments—admissions, surgery, laboratory, therapy, emergency medicine, nursing, physical plant, medical records, accounting, and so on. The hospital administrator works with the governing board in establishing general policies and operating philosophy and provides direction to assistant administrators, or vice presidents as they may be called, and department heads who carry out those policies. The administrator coordinates the activities of the assistant administrators and department heads to assure that the hospital runs efficiently, provides high quality medical care, and recovers adequate revenue to remain solvent or make a profit.



Nursing home administrators must have business ability and be good at dealing with people.

Many of the same management skills are needed by nursing home administrators. However, administrative staffs in nursing homes are typically much smaller than those in hospitals—nursing home administrators often have only one or two assistants, sometimes none. As a result, nursing home administrators "get their hands into" the detailed management decisions much more than hospital administrators in all but the smallest hospitals. They wear various hats—personnel director, director of finance, director of facilities, admissions director, for example—analyzing data and then making daily management decisions in all of these areas. In addition, because many nursing home residents are long term, staying 2 years or more, these administrators must provide for the psychological and social well-being of residents, as well as for health care.

In the growing field of group practice management, managers tend to the administrative and management functions involved in a large practice. Responsibilities include personnel, billing and collection, budgeting, planning, and sometimes advertising.

Health services managers in health maintenance organizations (HMO's) perform all of the functions of those in large medical group practices, but they perform one additional function—that of an insurance company. HMO enrollees pay an annual fee that covers almost all care. HMO managers must establish a comprehensive medical benefit package with enrollment fees low enough to attract adequate enrollments but high enough to operate successfully.

Working Conditions

Health services managers often work long hours. Facilities such as nursing homes and hospitals operate around the clock, and administrators and managers may be called at all hours to deal with emergencies. The job also may include travel to attend meetings or to inspect health care facilities.

Employment

Health services managers held about 336,000 jobs in 1984. Almost half of all jobs were in hospitals, as the following tabulation shows:

	Percent
Total	100
Hospitals	45
Offices of physicians (M.D.'s and D.O.'s)	19
Nursing homes	14
Offices of dentists	6
Outpatient care facilities	5
Medical and dental laboratories	3
Offices of other health practitioners	3
Other	2

Some health services managers direct the operations of nurses' registries and medical and dental laboratories.

Training, Other Qualifications, and Advancement

As is generally true with managerial jobs, most entrants transfer from other occupations. Knowledge of management principles and practices is the essential requirement for a position in this field, and such knowledge often is gained through work experience. Nonetheless, formal educational preparation is important, especially for those who wish to advance in the profession. Although a nurse supervisor may rise to director of nursing services based upon merit of performance, for example, a master's degree in health administration (MHA) is usually necessary for advancement beyond nursing director. For some other positions, a degree in business, personnel administration, or public administration provides an appropriate background; many graduate programs in these disciplines offer concentrations in health administration.

Many hospitals are setting up separate ventures such as outpatient surgical centers, alcohol treatment centers, and home health care services. When they operate at a profit, separate companies such as these can funnel needed revenue to the hospital. To operate and manage these subsidiary companies, hospitals—or the corporations that run them—are looking outside the health industry for managers with well-established skills in profit and loss analysis, marketing, and finance. Nonetheless, graduate education in health services administration remains a prerequisite for many upper level administrative positions within hospitals and their subsidiaries.

Academic programs in health administration, leading to a bachelor's, master's, or doctoral degree, are offered by colleges, universities, and schools of public health, allied health, and business administration. The various degree programs provide different levels of career preparation. The master's degree—in hospital administration, health administration, or public health—is regarded as the standard credential for many positions in this field. Educational requirements vary with the size of the organization and the amount of responsibility involved. Generally, larger organizations require more specialized academic preparation than smaller ones do.

In 1984, about 100 colleges and universities offered bachelor's degree programs in health services administration. About 70 schools had programs leading to the master's degree in hospital or health services administration; about 20 of these programs were in schools of public health. Some schools offer joint degree programs, leading to a master's in public health and a master's in business administration, for example.

To enter graduate programs, applicants must have a bachelor's degree, with courses in natural sciences, psychology, sociology, statistics, accounting, and economics. Competition for entry to these programs is keen, and applicants need above-average grades to gain admission. The programs generally last between 2 and 3 years. They include up to 1 year of supervised administrative experience, undertaken after completion of course work in such areas as hospital organization and management, accounting and budget control, personnel administration, strategic planning, and management of health information systems.

New graduates with master's degrees in health or hospital administration may be hired by hospitals as assistant administrators or, more often, as department heads or project directors. Postgraduate residencies and fellowships are offered by hospitals and other health facilities; these are normally staff jobs.

Growing numbers of graduates from master's degree programs are taking jobs in HMO's, large group medical practices, and clinics as these facilities continue to flourish. Students should be aware, however, that midlevel job transfers between HMO's, large medical groups, and hospitals may be difficult. Employers place a high value on experience in similar settings because some of the management skills are unique to each setting.

Relatively few master's degree recipients take administrative positions in nursing homes or life-care communities, although graduates of the small number of long-term care administration programs generally do so. Many nursing home administrators pursue graduate education while employed, however.

New recipients of bachelor's degrees in health administration usually begin their careers as administrative assistants or assistant department heads in larger hospitals, or as department heads or assistant administrators in small hospitals or in nursing homes.

The Ph.D. degree usually is required for positions in teaching, consulting, or research. Nursing service administrators are usually chosen from among supervisory registered nurses with administrative abilities and advanced education.

Licensure is not required in most areas of health services management, except for nursing home or long-term care administration. About 18 States currently require at least 2 years of college for licensure, while about 20 require a bachelor's degree. All States and the District of Columbia require these administrators to pass a licensing examination, and most students prepare for it by completing a special course of study. These preparatory courses, usually consisting of 100 to 200 hours of study in long-term care administration, are available through some colleges, universities, and home study programs. The licensing examination covers principles of administration; management of a long-term care facility; the role of government in long-term care; environmental health and safety; and medical, psychological, and social aspects of patient care. Nearly half the States require applicants to complete an internship known as an Administrator-in-Training program before taking the licensure examination. This internship generally lasts 1 year and is supervised by a licensed administrator. Since requirements vary from State to State, persons considering a career in long-term care administration should investigate licensing requirements where they wish to work.

Health services managers are often responsible for millions of dollars of facilities and equipment and hundreds of employees. They need a command of business and communication skills that allows them to make timely policy decisions and to motivate subordinates to implement those decisions. Administrators, especially head administrators, of all types of health organizations need to be self-starters.

In order to create an atmosphere favorable to good patient care, managers must like people, enjoy working with them, and be able to deal effectively with them. Managers also should be good at public speaking.

Health services managers advance in the profession by moving into more responsible and higher paying positions. They may do this within their own institution, or by shifting to another health care facility or organization. Frequently, the first job in a large institution is fairly narrow in scope—department head in charge of purchasing, for example. Advancement occurs with promotion to successively more responsible jobs such as assistant or associate administrator and, finally, chief executive officer (CEO). Health services managers sometimes begin their careers in small hospitals in positions with broad responsibilities, such as assistant administrator. Regardless of the path of advancement chosen, the ultimate occupational goal in hospitals and nursing homes is the position of CEO.

Outside the more traditional avenues of advancement, many managers take staff positions with the Veterans Administration, U.S. Public Health Service, or State or local departments of public health. Others find positions with voluntary health agencies such as the American Cancer Society or with trade and professional associations in the health care field. A growing number of jobs are available with firms that provide health management services on a contract basis. Jobs also are available in health planning agencies and professional review organizations. Individuals with academic training or experience in health administration are well suited for such positions.

Job Outlook

Employment of health services managers is expected to grow much faster than the average for all occupations through the mid-1990's as the industry continues to diversify and assume a for-profit orientation. Most job openings, however, will result from the need to replace personnel who transfer to another field or retire.

The various areas of health services management will grow at different rates in the years ahead. This reflects anticipated changes in the organization and delivery of health care due to overwhelming pressure to control costs.

Hospitals account for by far the largest proportion of health care spending. They are likely to remain a focal point for cost containment, and will not contribute as heavily to job growth in health services management in the future as they did in the past. Hospital employment is expected to grow more slowly than average between now and 1995, and the number of hospitals may actually decline. Restructuring of the hospital industry—the spinning off of separate companies to provide ambulatory surgery, alcohol and drug rehabilitation, or home health care, for example—will reduce the number of jobs in hospitals, while creating opportunities in the subsidiaries.

The importance of the hospital sector for employment of health services managers should not be underestimated, however. The rapidly changing hospital environment will provide career and advancement opportunities for managers with appropriate skills and experience. As hospitals become more specialized, concentrating on services that they are particularly well suited to deliver—whether it be neonatal care or burn treatment, for example—managers with strategic planning and marketing skills will be needed. Managers will also be needed to plan, install, and oversee comprehensive systems for monitoring and controlling resource use.

Facilities that provide outpatient care are expected to provide many of the new jobs for health services managers. Demand will be stimulated by the very rapid expansion of HMO's and group medical practices, and the emergence of such outpatient facilities as urgent care centers, surgicenters, cardiac rehabilitation centers, diagnostic imaging centers, and wellness centers.

HMO's continue to grow in number and membership, and they will provide numerous jobs for health services managers through 1995. Physicians forming group practices to take advantage of economies of scale and shared expenses are expected to provide many opportunities for administrators in the area of medical practice management. Ambulatory facilities such as outpatient surgical centers and after-hours clinics are expected to experience very rapid growth due to their convenience and competitive fee structure. As such facilities become more widespread, additional jobs will be generated.

With better medical care and healthier lifestyles, Americans are living longer than ever before. Very rapid growth in the number of older people in the years ahead is likely to exert strong pressure for an expansion of long-term care facilities—not just nursing homes, but home health agencies, adult day care programs, life care communities, and other residential facilities.

Opportunities for health services managers in nursing homes should be extremely favorable, in view of the exceptionally rapid growth that is projected for the population 85 years of age and above, expected to exceed 4 million persons by 1995. Compared to people in their 60's or 70's, very old people experience a greater incidence of chronic diseases and incapacitating conditions, and are far more likely to require institutional care. Nursing homes will need additional managers as these facilities add beds and expand the scope of their activities. Some nursing homes, for example, are already moving into the area of community care by setting up respite and adult day care programs.

Overriding concern for cost containment is producing shorter stays for hospital patients and, at the same time, generating demand for "aftercare" in a rehabilitation unit, nursing home, or at home. Rapid employment growth in the home health field is anticipated for the same reason, and also because of technological advances that make it possible for patients to receive services at home that previously would have required a hospital stay. Examples are intravenous chemotherapy and home ventilators for respiratory support. Opportunities for administrative positions in home health will be found in visiting nurse associations and other nonprofit agencies, in hospital-based home care programs, and in the rapidly expanding for-profit sector.

New approaches to delivering care for the sick and dying will create some openings in hospices, which may be freestanding or based within a hospital or nursing home. Hospice programs are very small and take a personal approach to each patient. The hospice movement stresses emotional and spiritual support for the dying patient and the family, and ready availability of drugs to control the excruciating pain that often accompanies terminal cancer, the disease most often suffered by hospice patients. Because the movement is so new, it is too soon to say what background lends itself best to hospice management.

Job opportunities for health administration graduates are expected to be best in HMO's, group medical practices, and nursing homes, although these jobs may not pay as well as hospital jobs. Traditionally a favored employment setting for health administration graduates, hospital management has become increasingly attractive to people with formal training in business administration. The suddenness of hospitals' shift from a service to a business orientation is expected to sustain demand for new MBA graduates. This development, coupled with slow industry growth, will greatly intensify competition for entry level jobs in hospital administration. One result may be that new graduates will be offered jobs at the department head or staff level rather than at the assistant administrator level, as was commonly the case until recently. Very stiff competition for upper level management jobs will continue, a reflection of the pyramidal management structure characteristic of most large and complex organizations.

In nursing homes and other long-term care facilities, where a graduate degree in health administration is not ordinarily a requirement, job opportunities for individuals with strong business or management skills will continue to be excellent.

Earnings

The personal standing and performance of the administrator, hospital size, geographic location, and the type of hospital ownership are all factors in determining the earnings of hospital administrators. According to a survey of compensation conducted for *Modern Healthcare* magazine, administrators in hospitals with fewer than 100 beds earned an average income of about $44,000 in 1984. In hospitals of 100 to 349 beds, administrators averaged $68,000 annually. In the largest hospitals, those with more than 1,000 beds, chief administrators averaged almost $120,000. The associate administrator is directly under the chief administrator. Earnings for associate administrators ranged from an average of about $30,000 annually in the smallest hospitals to about $62,000 in very large hospitals.

Nursing and personal care home administrators usually earn lower salaries than those paid administrators of hospitals of similar size. Chief administrators of home health care agencies had average earnings of $25,000 to $30,000 per year in 1984, according to limited information available.

Management incentive bonuses based on job performance are increasingly commonplace in executive compensation packages.

Starting salaries for recent graduates of master's programs in health administration averaged $27,000 in 1983, according to a national survey conducted by the Association of University Programs in Health Administration. Recent recipients of master's degrees in health administration starting work in Veterans Administration hospitals earned $21,804 a year in 1985.

Related Occupations

Health services managers plan programs, set policies, create marketing plans, and coordinate the use of resources for a health facilty agency. Other administrators with similar responsibilities include social welfare administrators, emergency medical services coordinators, public health directors, community organization directors, college or university department heads, comptrollers, department store managers, directors of data processing, and recreation superintendents.

Sources of Additional Information

Information about health administration and academic programs in this field is available from:

American College of Healthcare Executives, 840 North Lake Shore Dr., Chicago, Ill. 60611.

Association of University Programs in Health Administration, 1911 Fort Myer Drive, Suite 503, Arlington, Va. 22209.

National Health Council, Health Careers Program, 70 West 40th St., New York, N.Y. 10018.

American College of Health Care Administrators, P.O. Box 5890, 8120 Woodmont Ave., Suite 200, Bethesda, Md. 20814.

The American Association of Homes for the Aging maintains a listing of positions available and positions wanted in nonprofit nursing homes, life care communities, and housing for the elderly. For details, write:

Job Mart, AAHA, 1050 17th St. NW., Suite 770, Washington, D.C. 20036.

Hotel Managers and Assistants

(D.O.T. 187.117-038, .161-010, .167-026, -046, -078, -106, -110, -122, -126; and 320)

Nature of the Work

Hotel managers are responsible for the profitable operation of their establishments. They manage front office, housekeeping, food service, and recreational activities, and oversee management of the accounting, marketing and sales, personnel, security, and maintenance departments. Satisfying guests, handling problems, and coping with the unexpected are important parts of the job.

In a small hotel or motel with a limited staff, a manager may directly supervise most, if not all, departments. Large hotel and motel chains often centralize some activities, such as purchasing and advertising, so that individual hotels in the chain may not need managers for these departments. Managers who work for chains may be assigned to organize a newly built or purchased hotel or to reorganize an existing hotel or motel that is not operating successfully.

Working Conditions

Since hotels are open around the clock, night and weekend work is common. Hotel employees frequently must work on shifts. Managers who live in the hotel usually have regular work schedules, but they may be called for work at any time. Some employees of resort hotels are managers during the busy season and have other duties the rest of the year.

Hotel managers sometimes experience the pressures of coordinating a wide range of functions. Conventions and large groups of tourists may present unusual problems. Dealing with irate patrons can also be stressful. The job can be particularly hectic for front office managers around checkin and checkout time.

Employment

Hotel and motel managers held about 83,000 wage and salary jobs in 1984. An additional number—primarily owners of small hotels and motels—were self-employed.

Training, Other Qualifications, and Advancement

Experience generally is the most important consideration in selecting managers. This especially applies to food and beverage managers who require many skills. The hotel restaurant and cocktail lounge are often of great importance to the success of the entire establishment.

However, employers increasingly seek managers with college or specialized postsecondary education. A bachelor's degree in hotel and restaurant administration provides particularly strong preparation for a career in hotel management. In 1984, over 100 colleges and universities offered 4-year programs in this field. Several hundred junior colleges, technical institutes, and other academic institutions also have courses in hotel work that provide a good background. However, because a greater number of aspiring hotel managers are seeking formal training, applicants to these programs face increasing competition.

Included in many programs in hotel management are courses in hotel administration, accounting, economics, marketing, housekeeping, food service management and catering, hotel maintenance engineering, and data processing—reflecting the widespread use of computers in hotel operations such as reservations, accounting, and housekeeping. Part-time or summer work in hotels and restaurants is encouraged because the experience gained and the contacts made with employers may benefit students when they seek full-time employment after graduation.

Managers should have initiative, self-discipline, and the ability to organize and direct the work of others. They must be able to solve problems and concentrate on details.

Sometimes large hotels sponsor specialized on-the-job management training programs which enable trainees to rotate among various departments and gain a thorough knowledge of the hotel's operation. Other hotels may help finance the necessary training in hotel management for outstanding employees.

Most hotels promote employees who have proven their ability. Newly built hotels, particularly those without well-established on-the-job training programs, often prefer experienced personnel for managerial positions. Large hotel and motel chains may offer better opportunities for advancement than small, independently owned establishments. They have more extensive career ladder programs and offer managers the opportunity to transfer to another hotel or motel in the chain or to the central office if an opening occurs. Career advancement can be accelerated by completion of certification programs offered by the associations listed below. These programs generally require a combination of course work, examinations, and experience.

Computers help hotel managers control costs.

Job Outlook

Employment of salaried hotel managers is expected to grow faster than the average for all occupations through the mid-1990's as more large hotels and motels are built. While business travel will continue to grow, demand for additional hotels and motels is expected to stem primarily from increased domestic and foreign tourism. Most openings are expected to occur as experienced managers transfer to other occupations, retire, or stop working for other reasons.

Applicants who have college degrees in hotel administration should have a decided advantage in seeking entry positions and later advancement.

Earnings

In 1983, average annual earnings of salaried hotel managers and assistants were about $30,000, according to a survey by the American Hotel and Motel Association. Fifty percent of these managers earned between $21,000 and $36,000; the top 10 percent earned $47,000 or more. Generally, salaries are higher in larger hotels.

Salaries varied greatly because of differences in duties and responsibilities. For example, general managers averaged $43,000, whereas front office managers averaged $21,000. The manager's level of experience is also an important factor. In 1983, salaries of general managers ranged from over $20,000 to over $62,000; salaries of front office managers ranged from over $13,000 to almost $27,000. Managers may earn bonuses ranging up to 20 percent of their basic salary in some hotels. In addition, they and their families may be furnished with lodging, meals, parking, laundry, and other services.

Most managers and assistants receive 5 to 10 paid holidays a year, paid vacation, sick leave, life insurance, medical benefits, and pension plans. Some hotels offer profit sharing plans, educational assistance, and other benefits to their employees.

Related Occupations

Hotel managers and assistants are not the only workers concerned with organizing and directing a business in which pleasing people is very important. Others with similar responsibilities include apartment building managers, department store managers, and office managers.

Sources of Additional Information

For information on careers and scholarships in hotel management, send a self-addressed, stamped envelope to:

The American Hotel and Motel Association (AH&MA), 888 7th Ave., New York, N.Y. 10019.

For information on certification requirements and educational programs in hotel management, send a self-addressed, stamped envelope to:

The Educational Institute of AH&MA, 1407 S. Harrison Rd., Suite 310, East Lansing, Mich. 48823.

Information on careers in housekeeping management may be obtained from:

National Executive Housekeepers Association, Inc., 1001 Eastwind Dr., Suite 301, Westerville, Ohio 43081.

For a directory of colleges and other schools offering programs and courses in hotel and restaurant administration, write to:

Council on Hotel, Restaurant, and Institutional Education, Henderson Human Development Building, Suite S208, University Park, Pa. 16802.

School Principals and Assistant Principals

(D.O.T. 091.107-010, 099.117-018)

Nature of the Work

Principals and assistant principals provide the leadership and managerial skills required for a school's smooth operation. An effective principal is the key to a good school.

The task of principals has grown more complex in recent years. Not only are schools larger than ever before—the result of a continuing trend toward consolidation—but they touch the lives of many people, some of whom have become increasingly vocal in pursuing their goals. It takes political and diplomatic as well as administrative skills to handle the issues that confront school leaders today. But, as educators, principals have the satisfaction of knowing that their work smooths the way to knowledge for their schools' students.

Principals and assistant principals plan and set goals. To achieve these goals, they organize, coordinate, direct, and evaluate the activities of school personnel, ensuring that they meet deadlines and keep to their budgets.

Principals are the highest authority in a school. They are responsible for running the school according to the standards set by the superintendent and board of education.

The principal sets the academic tone for the entire school. High-quality instruction is the principal's most important responsibility. Principals visit classrooms, review instructional objectives, evaluate teachers, and examine learning materials. They also prepare budgets and administrative reports, keep track of attendance, and see that supplies are properly requisitioned and allocated. Despite such paperwork, principals spend much of the day with people. They confer with teachers and other staff—advising, explaining, or answering procedural questions; they meet with students; and they talk with parents and members of the community.

Principals and assistant principals are usually required to have several years of experience as classroom teachers.

Assistant principals may perform some of the same duties as principals and usually take over the responsibility for discipline, social and recreational programs, health and safety, and building and grounds maintenance. They may also provide individual or group counseling about personal, social, educational, or vocational matters.

Working Conditions

Principals work in their offices, but also spend time away from their desks at meetings with teaching staff, parent and teacher associations, the school board, and civic groups; sitting in on classes; attending school assemblies, social, and sports events; and checking school physical facilities.

Principals usually work more than a standard 40-hour week; at night and on weekends, they often attend meetings or handle urgent problems. Unlike teachers, principals usually work 11 months a year.

Employment

Elementary and secondary school principals and assistant principals held about 125,000 jobs in 1984, most of them in public school systems. Every school has a principal, and larger schools may have one or more assistant principals. Assistant principals are generally employed in secondary schools, which tend to be larger than elementary schools.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require certification of school administrators. Certification requirements may include good health and character, U.S. citizenship or State residency, graduate training in educational administration, teaching experience, and passing an examination. Information on specific requirements may be obtained from State departments of education.

Principals and assistant principals are required by most school systems to have several years of experience as classroom teachers. Some teachers move directly into principalships. Others first gain experience in an administrative job—such as curriculum specialist; financial advisor; or director of audiovisual aids, arts, or special education. A master's degree in educational administration is also usually required.

The National Council for Accreditation of Teacher Education accredits graduate programs in educational administration on nearly 300 campuses. These programs prepare people to become elementary and secondary school principals. Educational administration includes courses in school management, school law, school finance and budgeting, curriculum development and evaluation, supervision of instruction, research design and data analysis, personnel administration, community relations, politics in education, and leadership. A semester of internship and field experience is recommended.

In addition to experience and education, principals need leadership skills and managerial ability to direct, motivate, and inspire teachers, staff, and students. Because their duties may be rather loosely defined, school administrators must also have a strong sense of direction and motivation. Moreover, they are frequently under fire from many groups. Therefore, self-confidence and the ability to withstand criticism are essential, as are tact and communications skills. Principals may advance by moving to larger schools or becoming assistant superintendents for a school district.

Job Outlook

Employment of principals and assistant principals is expected to grow more slowly than the average for all occupations through the mid-1990's. Most job openings will be to replace administrators who leave the profession.

Pupil enrollment is the basic factor underlying the demand for school principals. Elementary school enrollments have begun rising again and are expected to continue to do so through 1995; secondary school enrollments are expected to decline through 1990 and then increase to about the 1984 level by 1995. Therefore, most employment growth will be among elementary school principals. However, excess school capacity due to declining enrollments in the past may permit some school districts to absorb more students without opening new schools and hiring new principals. School consolidation is also expected to continue for at least a while longer, moderating the demand.

Although openings for principals are expected to increase, competition for jobs may continue. Large numbers of teachers and other school personnel with graduate degrees in education or educational administration will compete for these administrative positions.

Earnings

Salaries of principals and assistant principals vary according to position, level of responsibility, and the size and geographic location of the school. In general, salaries are highest in the Far West and Mid-Atlantic States and lowest in the Southeast. According to the Educational Research Service, Inc., average salaries for principals and assistant principals in 1984-85 were as follows:

Principals:	
Senior high school	$42,094
Junior high/middle school	39,650
Elementary school	36,452
Assistant principals:	
Senior high school	35,491
Junior high/middle school	33,793
Elementary school	30,496

Related Occupations

School administrators need organizational and leadership skills to manage people, programs, and financial resources successfully. The same abilities are needed for administrative positions in health, welfare, religion, and recreation. Related occupations include hospital administrators, academic deans, directors of agencies on aging, library directors, college or university department heads, recreation and park directors, and museum curators.

Sources of Additional Information

For information about careers in school administration, contact:

American Association of School Administrators, 1801 North Moore St., Arlington, Va. 22209.

The National Association of Elementary School Principals, 1615 Duke St., Alexandria, Va. 22314-3406.

The National Association of Secondary School Principals, 1904 Association Drive, Reston, Va. 22091.

Management Support Occupations

Nature of the Work

Management support workers gather, process, and analyze data and develop information enabling management to formulate policy, improve procedures, oversee daily operations, and attain the organization's goals.

Accountants and auditors interpret accounting records to prepare statements or advise on systems of recording costs or other financial data. Underwriters determine the appropriate amount of coverage in insurance policies. Loan officers evaluate and approve mortgages and other loans. Other financial officers include credit counselors, estate planners, budget officers, trust officers, foreign-exchange traders, bonding agents, and credit analysts, among others.

Personnel, training, and labor relations specialists represent management or labor in collective bargaining procedures; participate in recruitment, selection, placement, training, welfare, safety, compensation, and promotion of employees; conduct job analyses to provide occupational information; and interview and counsel job applicants and employees to determine suitability for employment, vocational training, rehabilitation, and other employment development programs.

Management analysts conduct organizational studies and evaluations, develop procedures for new work processes, conduct work simplification and measurement studies, and maintain systems and procedures manuals to assist management in operating more efficiently.

Purchasing agents and buyers purchase goods, materials, or business services for internal use, resale, or further processing in industrial, governmental, business, and other establishments. These workers establish purchasing requirements for their organization, interview suppliers, negotiate prices, and establish delivery schedules.

Inspectors and compliance officers enforce and advise on health, safety, and other regulations pertaining to people, animals, plants, products, and establishments. Included among the numerous workers in this field are specialists in construction, immigration, boilers, health care facilities, transportation, customs, food and drugs, industrial waste, licenses, and agricultural commodities.

Other management support occupations include business and promotion agents—who represent clients in business operations; administrative assistants—who coordinate office services such as personnel, budget preparation, housekeeping, and records control; estimators—who prepare cost estimates for manufacturing of products, construction projects, or services; and administrative secretaries, security officers, and pursers, among others.

Working Conditions

Working conditions of management support workers vary. Much of the work is on a continuing daily basis—for example, claims takers for unemployment benefits. Others, such as tax accountants, experience peak seasonal workloads requiring much overtime. Some of these workers, such as employment interviewers and revenue agents, have considerable contact with the public in an office setting, while others spend much of their time away from the office—for example, construction inspectors and wholesale and retail buyers. Duties of some of these workers, such as compliance officers and construction inspectors, may be hazardous.

Employment

In 1984, management support workers held over 2.4 million jobs. Some—such as accountants and auditors; personnel, training, and labor relations specialists; and purchasing agents—are found in practically every industry. Other management support occupations are concentrated in only a few industries. Loan officers and counselors and credit analysts, for example, are found primarily in banks and credit agencies; and assessors, inspectors, tax examiners, tax collectors, and revenue agents are employed almost exclusively in government.

Training, Other Qualifications, and Advancement

The need for technical knowledge in these occupations is reflected in the educational attainment of management support personnel. In 1984, over one-half of all management support workers had completed 4 years or more of college—compared to over one-fifth of all workers. The median number of years of schooling for management support workers was 16 compared to 12.8 for all workers. Management support workers are required to keep abreast of new techniques and developments. For example, in 1984, one-fifth said they needed formal company training to improve their skills—nearly double the proportion of all workers who said that.

To attain full professional status and demonstrate competence in their field, some management support workers must complete certain education and experience requirements or pass license examinations. For example, underwriters may be designated as 'fellows' and accountants may become 'certified public accountants.'

Management support workers who demonstrate technical ability and supervisory skills are in a strong position to advance to managerial jobs—for example, accountant to treasurer, personnel specialist to personnel director, and underwriter to underwriting manager.

Job Outlook

Overall, employment of management support workers is expected to increase faster than the average for all occupations through the mid-1990's. Much faster than average growth is expected among accountants and auditors and employment interviewers. The increasing volume and complexity of financial information required of businesses should spur strong demand for accountants, while more employment interviewers will be needed to help employers find properly trained individuals to fill increasingly technical jobs. On the other hand, little or no change is expected in the employment of claims takers for unemployment benefits and tax examiners, tax collectors, and revenue agents as government spending to staff such positions is not expected to grow.

Earnings

Median annual earnings of management support workers were over $22,600 in 1984—compared to $17,000 for all workers. The middle 50 percent earned between $17,000 and $31,800. The lowest 10 percent earned $12,900 or less, while the top 10 percent earned over $43,700.

Earnings varied substantially by occupation. Purchasing agents and buyers of farm products had median earnings of less than $19,500, whereas management analysts had median earnings of over $30,500.

The following *Handbook* statements present more detailed information on a number of management support occupations.

Accountants and Auditors

(D.O.T. 160 through .167-042, and .267-014)

Nature of the Work

Managers must have up-to-date financial information to make important decisions. Accountants and auditors prepare, analyze, and verify financial reports that furnish this kind of information to managers in all business, industrial, and government organizations.

Four major fields are public, management, and government accounting, and internal auditing. Public accountants have their own businesses or work for accounting firms. Management accountants, also called industrial or private accountants, handle the financial records of their company. Government accountants and auditors maintain and examine the records of government agencies and audit private businesses and individuals whose dealings are subject to government regulations. Internal auditors verify the accuracy of their firm's financial records and check for waste or fraud.

Within each field, accountants often concentrate on one phase of accounting. For example, many public accountants are employed primarily in financial auditing (examining a client's financial records and reports and attesting that they are in comformity with standards of preparation and reporting). Others concentrate on tax matters, such as preparing income tax forms and advising clients of the tax advantages and disadvantages of certain business decisions. Still others concentrate on consulting and offer advice on a variety of matters. They might develop or revise an accounting system to serve the needs of clients more effectively or give advice about how to manage cash resources more profitably.

Management accountants, the largest group of accountants and auditors, provide the financial information executives need to make sound business decisions. They may work in areas such as taxation, budgeting, costs, or investments.

Internal auditing is rapidly growing in importance as top management must increasingly base its decisions on reports and records rather than personal observation. Internal auditors examine and evaluate their firm's financial and information systems, management procedures, and internal controls to ensure that records are accurate and controls are adequate to protect against fraud and waste. They also review company operations—evaluating their efficiency, effectiveness, and compliance with corporate policies and procedures, laws, and government regulations.

Accountants and auditors also work for Federal, State, and local governments. Many persons with accounting backgrounds work for the Federal Government as Internal Revenue Service agents or in financial management, financial institution examination, and budget administration.

In addition, a small number of persons trained as accountants staff the faculties of business and professional schools as accounting teachers, researchers, or administrators. Some work part time as accountants or consultants.

Computers are increasingly being used in accounting and auditing. With the aid of special computer software systems, accountants summarize transactions in standard formats for financial records, put the data in special formats that aid in financial or management analysis, and prepare income tax returns. Controls are placed in systems to enable auditors to ensure the reliability of the systems and the integrity of data. Software systems coming into use in accounting and auditing generally are easily learned and require few specialized computer skills, but greatly reduce the amount of tedious manual work with figures and records. Newer, less expensive personal computers are enabling accountants and auditors in all fields—even those who work independently—to use these special software systems and extract information from large mainframe computers. A few accountants and auditors have extensive computer skills and specialize in correcting problems with software systems or developing special software programs to meet unique data needs.

Working Conditions

Most accountants and auditors work in offices and have regular hours. Self-employed accountants, who may set up offices at home, work as many hours as the business requires.

Tax accountants work long hours under heavy pressure during the tax season. Accountants employed by large firms may travel extensively to audit or work for clients or branches of the firm.

Employment

Accountants and auditors held about 882,000 jobs in 1984; about 300,000 were Certified Public Accountants (CPA), 20,000 were licensed public accountants (primarily self-employed tax specialists), about 13,000 were Certified Internal Auditors (CIA), about 4,000 were Certified Management Accountants (CMA), and over 3,000 were Certified Information Systems Auditors (CISA). About 10 percent of all accountants were self-employed. Less than 10 percent worked part time.

Most accountants and auditors work in urban areas where public accounting firms and central or regional offices of businesses are concentrated.

Training, Other Qualifications, and Advancement

Most public accounting and business firms require applicants for accountant and internal auditor positions to have at least a bachelor's degree in accounting or a closely related field. Many employers prefer those with a master's degree in accounting or a

Management accountants provide the financial information executives need to make sound decisions.

master's degree in business administration with a concentration in accounting. A growing number of employers prefer applicants who are familiar with computers and their applications in accounting and internal auditing.

For beginning accounting and auditing positions, the Federal Government requires 4 years of college (including 24 semester hours in accounting or auditing) or an equivalent combination of education and experience. However, applicants face competition for the limited number of openings in the Federal Government.

Previous experience in accounting or auditing can help an applicant get a job. Many colleges offer students an opportunity to gain experience through summer or part-time internship programs conducted by public accounting or business firms. Such training is invaluable in gaining permanent employment in the field.

Professional recognition through certification or licensure also is extremely valuable. Anyone working as a Certified Public Accountant must have a certificate and a license issued by a State board of accountancy. The vast majority of States require CPA candidates to be college graduates, but some States substitute a certain number of years of public accounting experience for the educational requirement. Based on recommendations made by the American Institute of Certified Public Accountants, a few States require or are considering requiring CPA candidates to have training beyond the usual 4-year bachelor's degree—for example, a 5-year bachelor's degree or a master's degree. This requirement may become more common in the coming years.

All States use the four-part Uniform CPA Examination, prepared by the American Institute of Certified Public Accountants, to establish eligibility for certification. The CPA examination is rigorous, and candidates are not required to pass all four parts at once. However, most States require candidates to pass at least two parts for partial credit. Many States require all sections of the test to be passed within a certain period of time. Most States require applicants for a CPA certificate to have some public accounting experience. For example, bachelor's degree holders most often need 2 years of experience, while master's degree holders often need no more than 1 year.

To become a licensed public accountant (LPA) or "accounting practitioner," some States require only a high school diploma; others require college training. However, with dramatic growth in the number of CPA's, some States no longer offer the LPA designation. Information on requirements may be obtained directly from individual State boards of accountancy or from the National Society of Public Accountants (NSPA).

Professional societies grant other forms of certification on a voluntary basis. The Institute of Internal Auditors, Inc., confers the designation Certified Internal Auditor (CIA) upon graduates from accredited colleges and universities who have completed 2 years' experience in internal auditing and who have passed a four-part examination. The EDP Auditors Association confers the designation Certified Information Systems Auditor (CISA) upon candidates who pass an examination and who have completed 5 years' experience in auditing, of which at least 2 involved auditing electronic data processing systems. The National Association of Accountants (NAA) confers the Certificate in Management Accounting (CMA) upon candidates who pass a series of uniform examinations and meet specific educational and professional standards. The Accreditation Council for Accountancy awards accreditation in accountancy and taxation to persons who have passed a comprehensive examination. Accreditation is maintained by completing mandatory continuing education.

Persons planning a career in accounting should have an aptitude for mathematics, be able to analyze, compare, and interpret facts and figures quickly, and make sound judgments based on this knowledge. They must question how and why things are done and be able to clearly communicate the results of their work, orally and in writing, to clients and management.

Accountants and auditors must be patient and able to concentrate for long periods of time. They must be good at working with business systems and computers as well as with people. Accuracy and the ability to handle responsibility with limited supervision are important.

Perhaps most important, because millions of financial statement users rely on their services, accountants and auditors should have high standards of integrity.

A growing number of States require both CPA's and licensed public accountants to complete a certain number of hours of continuing education before licenses can be renewed. The professional associations representing accountants sponsor numerous courses, seminars, group study programs, and other forms of continuing education. Increasingly, accountants and auditors are learning how to operate computers so they can use accounting software packages that enable raw transactions data to be quickly transformed into a variety of specialized reports and tabulations.

Capable accountants and auditors should advance rapidly; those having inadequate academic preparation may be assigned routine jobs and find promotion difficult. Many graduates of junior colleges and business and correspondence schools, as well as outstanding bookkeepers and accounting clerks who meet the education and experience requirements set by their employers, are successful in landing junior accounting positions.

Beginning public accountants usually start by assisting with auditing work for several clients. They may advance to intermediate positions with more responsibility in 1 or 2 years and to senior positions within another few years. Those who deal successfully with top industry executives often become supervisors, managers, or partners, or transfer to executive positions in private firms. Some open their own public accounting offices.

Beginning management accountants often start as ledger accountants, junior internal auditors, or as trainees for technical accounting positions. They may advance to chief plant accountant, chief cost accountant, budget director, or manager of internal auditing. Some become controllers, treasurers, financial vice-presidents, or corporation presidents. Many corporation executives have backgrounds in accounting, internal auditing, and finance.

Job Outlook

Employment of accountants and auditors is expected to grow much faster than the average for all occupations through the mid-1990's due to the key role these workers play in the management of all types of businesses. Although increased demand will generate many new jobs, most openings will result from the need to replace workers who leave the occupation, retire, or die. While accountants and auditors tend to leave the profession at a lower rate than members of most other occupations, replacement needs will be substantial because the occupation is large.

As businesses grow, the volume and complexity of information on budgets, expenditures, and taxes will grow as well. Plant expansion, mergers, or foreign investments may depend upon the financial condition of the firm, tax implications of the proposed action, and other considerations. Thus requirements for accountants and auditors will grow. Requirements may also be affected by changes in legislation related to taxes, financial reporting standards, business investment, and other financial matters. Small businesses are expected to rely more and more on the expertise of accountants in planning and managing their operations. In addition, increases in investment and lending associated with general economic growth also should spur demand for accountants and auditors. The increasing use of computers in accounting should stimulate the demand for accountants and auditors familiar with their operation.

Opportunities are expected to be favorable for college graduates seeking accounting and auditing jobs. Certified accountants, particularly CPA's, should have a wider range of job opportunities than other accountants. However, competition for jobs with prestigious accounting firms will remain keen; a master's degree in accounting should be an asset. Opportunities for accountants without a college degree will occur mainly in small businesses and accounting firms.

Many employers prefer graduates who have worked part time in a business or accounting firm while in school. In fact, experience has become so important that some employers in business and industry seek persons with 1 or 2 years' experience for beginning positions.

Accountants rarely lose their jobs when other workers are laid off during hard economic times. Financial information must be developed and tax reports prepared regardless of the state of the economy.

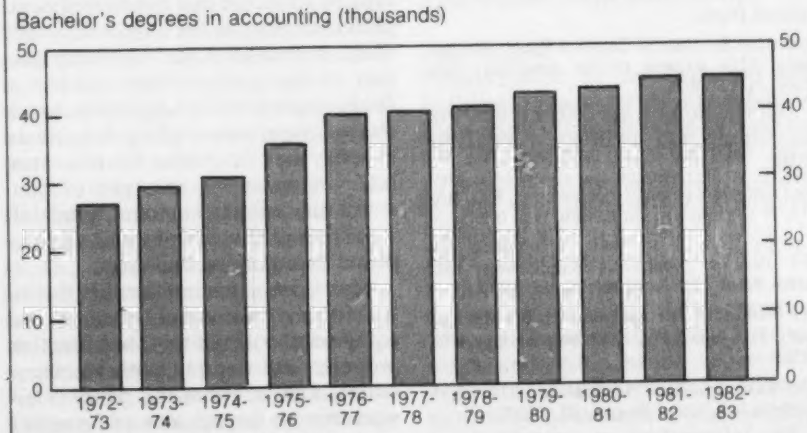
Earnings

According to a 1984 College Placement Council Salary Survey, bachelor's degree candidates in accounting received offers averaging around $19,500 a year; master's degree candidates, $23,200.

Beginning public accountants employed by public accounting firms averaged $19,100 a year in 1984, according to a national survey. The middle 50 percent had starting salaries ranging from $18,300 to $20,000. Salaries of junior public accountants who were not owners or partners of their firms averaged $22,600, but some had salaries of more than $30,000. Many owners and partners of firms earned considerably more.

The starting salary of management accountants in private industry averaged about $19,500 a year in 1984, according to the same survey. The middle 50 percent had starting annual salaries ranging from $17,700 to $21,800. Salaries of nonsupervisory management accountants averaged $32,200 in 1984, and some of the most experienced had salaries of over $60,000. Chief management accoun-

Growth in the number of accounting degrees granted annually has moderated since the mid-1970's.



SOURCE: National Center for Education Statistics tants who direct the accounting program of a company or one of its establishments averaged $47,400 a year. Their salaries ranged from $30,000 to more than $70,000, depending upon the scope of their authority and the size of their professional staff.

According to the same survey, beginning trainee internal auditors averaged $19,700 a year in 1984. The middle 50 percent had annual starting salaries ranging from $16,600 to $22,400. Internal auditors averaged $29,000, but some of the most experienced had salaries of more than $40,000.

In the Federal Government, the starting annual salary for junior accountants and auditors was about $14,400 in early 1985. Candidates who had a superior academic record could begin at $17,800. Applicants with a master's degree or 2 years' professional experience began at $21,800. Accountants in the Federal Government averaged about $33,500 a year in 1984; auditors, about $34,200.

Related Occupations

Accountants and auditors design internal control systems and analyze financial data. Others for whom training in accounting is invaluable include appraisers, budget officers, loan officers, financial analysts, bank officers, actuaries, underwriters, tax collectors and revenue agents, FBI special agents, securities sales workers, and purchasing agents.

Sources of Additional Information

Information about careers in public accounting and about competency tests administered in colleges and public accounting firms may be obtained from:

American Institute of Certified Public Accountants, 1211 Avenue of the Americas, New York, N.Y. 10036.

Information on specialized fields of accounting and auditing is available from:

National Association of Accountants, P.O. Box 433, 10 Paragon Dr., Montvale, N.J. 07645.

National Society of Public Accountants and Accreditation Council for Accountancy, 1010 North Fairfax St., Alexandria, Va. 22314.

The Institute of Internal Auditors, 249 Maitland Ave., P.O. Box 1119, Altamonte Springs, Fla. 32701.

The EDP Auditors Association, 373 South Schmale Rd., Carol Stream, Ill. 60188.

For information on accredited accounting programs and educational institutions offering a specialization in accounting, contact:

American Assembly of Collegiate Schools of Business, 605 Old Ballas Rd., Suite 220, St. Louis, Mo. 63141.

Construction and Building Inspectors

(D.O.T. 168.167-030, -034, -038, -046, and -050; .267-010, -102; 182.267; 850.387, .467)

Nature of the Work

Construction and building inspectors examine the construction, alteration, or repair of highways, streets, sewer and water systems, dams, bridges, buildings, and other structures to insure compliance with building codes and ordinances, zoning regulations, and contract specifications. Inspectors generally specialize in one particular type of construction work. Broadly categorized, these are building, electrical, mechanical, and public works. Inspectors usually work alone on small jobs, but several may be assigned to a large, complex project.

Building inspectors inspect the structural quality of buildings. Some may specialize—for example, in structural steel or reinforced concrete buildings. Before construction, plan checkers determine whether the plans for the building or other structure comply with building code regulations and are suited to the engineering and environmental demands of the building site. They visit the worksite before the foundation is poured to inspect the positioning and depth of the footings. They inspect the foundation after it has been completed. The size and type of structure and the rate of completion determine the number of other visits they must make. Upon completion of the project, they conduct a final comprehensive inspection. In addition, inspectors working for private industry may determine fire insurance rates by assessing the type of construction, building contents, availability of firefighting equipment, and risks posed by adjoining buildings.

Electrical inspectors inspect the installation of electrical systems and equipment to insure that they function properly and comply with electrical codes and standards. They visit worksites to inspect new and existing wiring, lighting, sound and security systems, and generating equipment. They also may inspect the installation of the electrical wiring for heating and air-conditioning systems, kitchen appliances, and other components.

Plumbing inspectors examine plumbing systems, including septic tanks; plumbing fixtures and traps; and water, sewer, and vent lines.

Mechanical inspectors inspect the installation of the mechanical components of kitchen appliances, heating and air-conditioning equipment, gasoline and butane tanks, gas piping, and gas-fired appliances. Some specialize in inspecting boilers.

Public works inspectors insure that Federal, State, and local government construction of water and sewer systems, highways, streets, bridges, and dams conforms to detailed contract specifications. They inspect excavation and fill operations, the placement of forms for concrete, concrete mixing and pouring, asphalt paving, and grading operations. They record the work and materials used so that contract payments can be calculated. Public works inspectors may specialize in highways, reinforced concrete, or ditches. Others specialize in dredging operations required for bridges and dams or for harbors.

Construction and building inspectors increasingly use computers to help them monitor construction activity. Details about construction projects, building and occupancy permits, and other information can be stored and easily retrieved.

Although inspections are primarily visual, inspectors often use tape measures, survey instruments, metering devices, and test equipment such as concrete strength measurers. They often keep a daily log of their work, take photographs, file reports, and, if necessary, act on their findings. For example, construction inspectors notify the construction contractor, superintendent, or supervisor when they discover a detail of a project that does not comply with the appropriate codes, ordinances, or contract specifications. If the deficiency is not corrected within a reasonable period of time, government inspectors have authority to issue a "stop-work" order.

Many inspectors also investigate reported incidents of "bootlegging," that is, construction or alteration that is being carried on without proper permits. Violators of permit laws are directed to obtain permits and submit to inspection.

Working Conditions

Construction and building inspectors work indoors and out. They may spend much of their time in a field office reviewing blueprints, answering letters or telephone calls, writing reports, and scheduling inspections. The rest of their time is spent inspecting construction and building sites.

Inspection sites may be dirty and cluttered with tools, materials, or debris. Inspectors may have to climb ladders or several flights of stairs, or may have to crawl beneath buildings. However, the work is not considered hazardous.

Inspectors normally work regular hours. However, if an accident occurs at a construction site, such as a partially collapsed concrete structure, inspectors must respond immediately and may work irregular hours to complete their report.

Employment

Construction and building inspectors held about 55,000 jobs in 1984. Nearly half worked for local governments, primarily municipal or county building departments. The employment of local government inspectors is concentrated in cities and in suburban areas undergoing rapid growth. These governments employ large inspection staffs, including most of the inspectors who specialize in structural steel, reinforced concrete, boiler, and elevator inspection.

Over 20 percent of all construction and building inspectors were employed at the Federal and State levels. Nearly half of the construction inspectors employed by the Federal Government in 1984 worked for the Department of Defense, primarily for the U.S. Army Corps of Engineers. Other important Federal employers include the Tennessee Valley Authority and the Departments of Housing and Urban Development, Agriculture, and Interior.

About one-third of all inspectors worked for private industry, overwhelmingly for construction companies. The insurance industry employed a relatively small number of inspectors.

Training, Other Qualifications, and Advancement

To become a construction or building inspector, several years of experience as a construction contractor, supervisor, or craft worker are generally required. Most employers also require an applicant to have a high school diploma. High school preparation should include courses in drafting, algebra, geometry, and English.

Workers who want to become inspectors should have a thorough knowledge of construction materials and practices in either a general area like structural or heavy construction, or in a specialized area such as electrical or plumbing systems, reinforced concrete, or structural steel. A significant number of construction and building inspectors have recent experience as carpenters, electricians, plumbers, or pipefitters.

Many employers prefer inspectors who have graduated from an apprenticeship program, have studied engineering or architecture for at least 2 years, or have a degree from a community or junior college, with courses in construction technology, blueprint reading, mathematics, and building inspection.

Construction and building inspectors must be in good physical condition in order to walk and climb about construction sites. They also must have a motor vehicle operator's license. In addition, Federal, State, and many local governments usually require that inspectors pass a civil service examination.

Construction and building inspectors usually receive most of their training on the job. During the first couple of weeks, working with an experienced inspector, they learn about inspection techniques; codes, ordinances, and regulations; contract specifications; and recordkeeping and reporting duties. They begin by inspecting less complex types of construction such as residential buildings. The difficulty of their assignments is gradually increased until they are able to handle complex assignments. An engineering degree is frequently needed to advance to supervisory inspector.

Since they advise representatives of the construction industry and the general public on building code interpretation, construction practices, and technical developments, construction and building inspectors must keep abreast of new building code developments. Many employers provide formal training programs to broaden inspectors' knowledge of construction materials, practices, and inspection techniques. Inspectors who work for small agencies or firms that do not conduct training programs can broaden their knowledge and upgrade their skills by attending State-conducted training programs or by taking college or correspondence courses.

A building inspector monitors the installation of piping.

Certification enhances construction inspectors' chances for higher paying, more responsible positions. Some States and cities require certification for employment. Inspectors having substantial experience and education can attain certification by passing stringent examinations on construction techniques, materials, and code requirements offered by the model code organizations listed below.

Job Outlook

Employment of construction and building inspectors is expected to grow more slowly than the average for all occupations through the mid-1990's. Increased construction activity will spur demand for inspectors. However, greater use of computers to store information on construction projects makes inspectors more productive. In addition, the assumption of some inspection functions by engineers and maintenance supervisors expedites construction and limits growth of construction and building inspector jobs.

Employment of construction and

building inspectors is not always directly affected by changes in the level of building activity. Unlike most construction occupations, inspectors do not usually experience layoffs when construction activity declines. During these periods, maintenance and renovation generally continue, enabling inspectors to continue working full time year round. In an upturn, new jobs for inspectors increase but not to the same degree as construction activity.

Most job openings will arise from the need to replace inspectors who retire or leave the occupation for other reasons. Because of the increasing complexity of construction technology and the trend toward the establishment of professional standards for inspectors, job prospects should be best for highly experienced craft workers who have some college education or who are certified as inspectors.

Earnings

The median annual salary of construction and building inspectors was $21,400 in 1984. The lowest 10 percent earned $11,200 or less, while the highest 10 percent earned over $35,900. Salaries in large metropolitan areas are substantially higher than those in small local jurisdictions. Salaries in the North and West are slightly higher than salaries in the South.

The average salary of inspectors in the Federal Government was $25,100 in 1984.

Related Occupations

Construction and building inspectors combine a knowledge of construction principles and law with the ability to coordinate data, diagnose problems, and communicate with people. Other occupations involving a combination of similar skills are drafters, estimators, industrial engineering technicians, and surveyors.

Sources of Additional Information

Information about a career and certification as a construction or building inspector is available from the following model code organizations:

International Conference of Building Officials, 5360 South Workman Mill Rd., Whittier, Calif. 90601.

Building Officials and Code Administrators International, Inc., 4051 West Flossmoor Rd., Country Club Hills, Ill. 60477.

Southern Building Code Congress International, Inc., 900 Montclair Road, Birmingham, Ala. 35213.

For information about a career as a State or local government construction or building inspector, contact your State or local employment service.

Persons interested in a career as a construction and building inspector with the Federal Government can obtain information from:

U.S. Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

Inspectors and Compliance Officers, except Construction

(D.O.T. 160.167-046; 168.161; .167-014 through -026, -042, -062, -066, -074 through -086; .261; .264; .267 except -010, -014, -038, and -102; .287; .367; .387; 169.267-014, -030; .284; 184.163; 187.167-062; 188.167-038, -074, -090; 196.163; 959.367-018)

Nature of the Work

Protecting the public from health and safety hazards, prohibiting unfair trade and employment practices, controlling immigration, preventing entry of prohibited matter, regulating business practices, and raising revenue are important responsibilities. Inspectors and compliance officers enforce the laws and regulations that govern these responsibilities. (Construction and building inspectors are discussed elsewhere in the *Handbook*.)

Depending upon their employer, inspectors vary widely in title and responsibilities.

Health Inspectors. Health inspectors work with engineers, chemists, microbiologists, and health workers to insure compliance with public health and safety regulations governing food, drugs, cosmetics, and other consumer products. They also administer regulations that govern the quarantine of persons and products entering the United States from foreign countries. The major types of health inspectors are: Consumer safety, food, agricultural quarantine, and environmental health inspectors. In addition, some inspectors work in a field closely related to food inspection—agricultural commodity grading.

Most *consumer safety inspectors* specialize in food, feeds and pesticides, weights and measures, cosmetics, or drugs and medical equipment. Some are proficient in several areas. Working individually or in teams under a senior or supervisory inspector, they periodically check firms that produce, handle, store, and market food, drugs, and cosmetics. They look for inaccurate product labeling, and for decomposition or chemical or bacteriological contamination that could result in a product becoming harmful to health. They use portable scales, cameras, ultraviolet lights, container sampling devices, thermometers, chemical testing kits, radiation monitors, and other equipment to ascertain violations. They send product samples collected as part of their examinations to laboratories for analysis.

After completing their inspection, inspectors discuss their observations with plant managers or officials and point out areas where corrective measures are needed. They write reports of their findings, and, when necessary, compile evidence that may be used in court if legal action must be taken to enforce the law.

Federal and State laws empower *food inspectors* to inspect meat, poultry, and their byproducts to insure that they are wholesome and safe for public consumption. Working as an onsite team under a veterinarian, they inspect meat and poultry slaughtering, processing, and packaging operations. They also check for correct product labeling and proper sanitation.

Agricultural quarantine inspectors protect American agricultural products from the spread of foreign plant pests and animal diseases. To safeguard crops, forests, gardens, and livestock, they inspect ships, aircraft, railroad cars, and motor vehicles entering the United States for restricted or prohibited plant or animal materials.

Environmental health inspectors, or sanitarians, who work primarily for State and local governments, insure that food, water, and air meet government standards. They check the cleanliness and safety of food and beverages produced in dairies and processing plants, or served in restaurants, hospitals, and other institutions. They often examine the handling, processing, and serving of food for compliance with sanitation rules and regulations. They oversee the treatment and disposal of sewage, refuse, and garbage. They examine places where pollution is a danger, test for pollutants, and collect air or water samples for analysis. They determine the nature and cause of pollution and initiate action to stop it.

In large local and State health or agriculture departments, environmental health inspectors may specialize in milk and dairy products, food sanitation, waste control, air pollution, institutional sanitation, or occupational health. In rural areas and small cities, they may be responsible for a wide range of environmental health activities.

Agricultural commodity graders apply quality standards to aid the buying and selling of commodities and to insure that retailers and consumers receive wholesome and reliable products. They generally specialize in an area such as eggs and egg products, meat, poultry, processed or fresh fruits and vegetables, grain, tobacco, cotton, or dairy products. They examine product samples to determine quality and grade, and issue official grading certificates. Graders also may inspect the plant and equipment to maintain sanitation standards.

Regulatory Inspectors. Regulatory inspectors insure compliance with laws and regulations that protect the public welfare. Important types of regulatory inspectors are: Immigration; customs; air safety; railroad; motor vehicle; occupational safety and health; mine; wage-hour compliance; and alcohol, tobacco, and firearms inspectors.

Immigration inspectors interview and examine people seeking to enter the United States and its territories. They inspect passports to determine whether people are legally eligible to enter and to verify their citizenship status and identity. Immigration inspectors also prepare reports, maintain records, and process applications and petitions for immigration or temporary residence in the United States.

Customs inspectors enforce laws governing imports and exports. Stationed at airports, seaports, and border crossing points, they examine, count, weigh, gauge, measure, and sample commercial cargoes entering and leaving the United States to determine admissibility and the amount of tax that must be paid. They also inspect baggage and articles worn by passengers and crew members to insure that all merchandise is declared, proper duties are paid, and contraband is not present.

Postal inspectors observe the functioning of the postal system and recommend improvements. They investigate criminal activities such as theft and misuse of the mail. In instances of suspected mismanagement or fraud, they conduct management or financial audits. They collaborate with other government agencies, such as the Internal Revenue Service, as members of special task forces.

Aviation safety inspectors insure that Federal Aviation Administration (FAA) regulations which govern the quality and safety of aircraft equipment and personnel are maintained. Aviation safety inspectors may inspect aircraft and equipment manufacturing, maintenance and repair, or flight operations procedures. They usually specialize in either commercial or general aviation aircraft. They also examine and certify aircraft pilots, pilot examiners, flight instructors, schools, and instructional materials.

Railroad inspectors verify the compliance of railroad systems and equipment with Federal safety regulations. They investigate accidents and review railroads' operating practices.

Motor vehicle inspectors verify the compliance of automobiles and trucks with State requirements for safe operation and emissions. They inspect truck cargoes to assure compliance with legal limitations on gross weight and hazardous cargoes.

Traffic inspectors oversee the scheduled service of streetcar, bus, or railway systems. They report conditions hazardous to passengers and disruptive to service. They determine the need for additional vehicles, revised schedules, or other changes to improve service.

Occupational safety and health inspectors visit places of employment to detect unsafe machinery and equipment or unhealthy working conditions. They discuss their findings with the employer or plant manager and urge that violations be promptly corrected in accordance with Federal, State, or local government safety standards and regulations.

Mine inspectors work to insure the health and safety of miners. They visit mines and related facilities to obtain information on health and safety conditions and to enforce safety laws and regulations. They discuss their findings with the management of the mine and issue notices describing violations and hazards that must be corrected. They also investigate and report on mine accidents and may direct rescue and firefighting operations when fires or explosions occur.

Wage-hour compliance inspectors inspect employers' time, payroll, and personnel records to insure compliance with Federal laws on minimum wages, overtime, pay, employment of minors, and equal employment opportunity. They often interview employees to verify the employer's records and to check for complaints.

Equal opportunity representatives ascertain and correct unfair employment practices through consultation with and mediation between employers and minority groups.

Alcohol, tobacco, and firearms inspectors inspect distilleries, wineries, and breweries; cigar and cigarette manufacturing plants; wholesale liquor dealers and importers; firearms and explosives manufacturers, dealers, and users; and other regulated facilities. They insure compliance with revenue laws and other regulations on operating procedures, unfair competition, and trade practices, and determine that appropriate taxes are paid.

Securities and real estate directors implement regulations concerning securities and real estate transactions. Their departments investigate applications for registration of securities sales and complaints of irregular securities or real estate transactions, and recommend necessary legal action.

Revenue officers investigate delinquent tax returns and liabilities. They discuss the resolution of tax problems with taxpayers and recommend penalties and prosecution when necessary.

Attendance officers investigate continued absences of pupils from public schools.

Dealer compliance representatives inspect franchised establishments to ascertain compliance with the franchiser's policies and procedures. They may suggest changes in financial and other operations.

Logging operations inspectors review contract logging operations. They prepare reports and issue remedial instructions for violations of contractual agreements and of fire and safety regulations.

Travel accommodations raters inspect hotels, motels, restaurants, campgrounds, and vacation resorts. They evaluate travel and tourist accommodations for travel guide publishers and organizations such as tourism promoters and automobile clubs.

Other inspectors and compliance officers include coroners, code inspectors, and mortician investigators.

Working Conditions

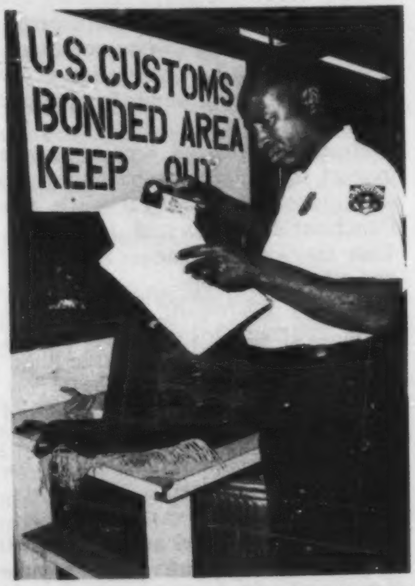
Inspectors and compliance officers live an active life; they meet many people and work in a variety of environments. Their jobs often involve considerable fieldwork, and some inspectors travel frequently. They are furnished with an automobile or are reimbursed for travel expenses.

At times, inspectors have unfavorable working conditions. For example, mine inspectors often are exposed to the same hazards as miners. Customs inspectors may be threatened by smugglers and other criminals. Food and alcohol, tobacco, and firearms inspectors frequently come in contact with strong, unpleasant odors. Many inspectors work long and often irregular hours.

Employment

Inspectors and compliance officers held 122,000 jobs in 1984. About 31 percent were employed by State governments, 28 percent by the Federal Government, and 25 percent by local governments. The remainder—16 percent—were employed in the U.S. Postal Service and throughout the private sector—primarily in insurance companies, hospitals, and manufacturing firms.

The largest single employer of consumer safety inspectors is the U.S. Food and Drug Administration, but the majority work for State governments. Most food inspectors and agricultural commodity graders in processing plants are employed by the U.S. Department of Agriculture. Agricultural quarantine inspectors work for the U.S. Department of Agriculture. Most environmental health inspectors work for State and local governments.



Customs inspector checks to see if import duty has been paid.

Most Federal regulatory inspectors work in regional and district offices throughout the United States. The Treasury Department employs internal revenue officers. Aviation safety inspectors work for the Federal Aviation Administration. The Department of Labor employs wage-hour compliance officers, and the Treasury Department employs alcohol, tobacco, and firearms inspectors. Occupational safety and health inspectors and mine inspectors also work for the Department of Labor, as well as for many State governments. Immigration inspectors are employed by the Department of Justice. Customs inspectors work for the Treasury Department. Like agricultural quarantine inspectors, immigration and customs inspectors work at U.S. airports, seaports, and border crossing points, and at foreign airports and seaports.

Training, Other Qualifications, and Advancement

Because of the diversity of functions, qualifications for inspector and compliance officer jobs differ greatly. Requirements are a combination of education, experience, and a written examination. Employers generally prefer applicants with college training, including coursework related to the job.

Food inspectors must have related experience and pass an examination based on specialized knowledge.

Aviation safety inspectors must have considerable experience in aviation maintenance and knowledge of the industry and relevant Federal laws. In addition, FAA mechanic or pilot and medical certificates are required. Some also are required to have an FAA flight instructor rating. Many aviation safety inspectors have had flight training and mechanical training in the Armed Forces. No written examination is required.

Applicants for mine safety inspector positions generally must have experience in mine safety, management, or supervision, or possess a skill such as that of an electrician (for mine electrical inspectors). In some cases, a general aptitude test may be required.

Applicants for internal revenue officer jobs must have a bachelor's degree or 3 years of business, legal, or investigative work experience that displays strong analytical ability.

Some civil service examinations, including those for agricultural quarantine inspectors and agricultural commodity graders, rate applicants solely on their experience and education and require no written examination.

Environmental health inspectors, called sanitarians in many States, usually must have a bachelor's degree in environmental health or the physical or biological sciences. In most States, they are licensed by examining boards.

All inspectors and compliance officers are trained in applicable laws and inspection procedures through a combination of classroom and on-the-job training. In general, people who want to enter this occupation should be able to accept responsibility and like detailed work. They should be neat and personable and able to express themselves well orally and in writing.

Federal Government inspectors and compliance officers whose job performance is satisfactory advance through their career ladder to a specified full performance level. Above this level (usually supervisory positions), advancement is competitive, based on agency needs and individual merit. Advancement opportunities in State and local governments and the private sector are often similar to those in the Federal Government.

Job Outlook

Employment of inspectors and compliance officers as a group is expected to increase more slowly than the average for all occupations through the mid-1990's. Employment growth is expected to be constrained by slow growth in government regulatory programs and in government spending. Most job openings will be to replace those who transfer to other occupations, retire, or leave the labor force for other reasons.

Employment of inspectors and compliance officers is seldom affected by general economic fluctuations. Most work in programs which enjoy wide public support. As a result, they are less likely to lose their jobs than many other workers when government programs are cut.

Earnings

The median annual salary of inspectors and compliance officers, except construction, was $23,700 in 1984. The lowest 10 percent earned less than $15,600; the highest 10 percent earned at least $38,800.

Most starting Federal salaries were around $14,400 a year in 1985. However, some inspectors and compliance officers—for example, aviation safety officers and postal inspectors—had higher starting salaries.

In the Federal Government, the average annual salary was somewhat higher—$28,900—in 1984. Depending upon the nature of the inspection or compliance activity, the average salary varied substantially—from $18,800 to $42,100. Table 1 presents average salaries for selected inspectors and compliance officers in the Federal Government in 1984.

Table 1. Salaries of selected Federal inspectors and compliance officers, 1984

Type of inspector	Average salary
Postal inspectors	$42,100
Transportation inspectors—air, aviation, motor carrier, railroad, and highway safety	42,000
Consumer safety inspectors	36,500
Coal mine inspectors	35,800
Wage and hour compliance officials	35,200
Civil rights and equal employment opportunity officials	34,600
Alcohol, tobacco, and firearms inspectors	30,700
Internal revenue officers	27,700
Customs inspectors	26,700
Food and agricultural commodity inspectors	25,800
Immigration inspectors	24,200
Environmental health and safety technicians	18,800

SOURCE: U.S. Office of Personnel Management.

Salaries of inspectors and compliance officers in State and local governments and in private industry are generally lower than their Federal counterparts.

According to a 1984 survey by the International Personnel Management Association, nonsupervisory environmental health inspectors working for selected U.S. cities and counties received average starting salaries of almost $18,700 in 1984; those working for State governments started at about $3,200 less. Experienced environmental health inspectors working for State governments earned over $17,400, but top supervisors and administrators made as much as $27,500 in 1984.

Related Occupations

Inspectors and compliance officers are responsible for seeing that laws and regulations are obeyed. Revenue agents, construction and building inspectors, fire marshals, State and local police officers, customs patrol officers, customs special agents, and fish and game wardens also enforce laws.

Sources of Additional Information

Information on Federal Government jobs in available from offices of the State employment service, area offices of the U.S. Office of Personnel Management, and Federal Job Information Centers in large cities throughout the country. For information on a career as a specific type of inspector or compliance officer, the Federal department or agency that employs them may also be contacted directly.

Information about State and local government jobs is available from State civil service commissions, usually located in each State capital, or from local government offices.

Information about jobs in private industry is available from the Job Service. It is listed under "Job Service" or "Employment" in the State government section of local telephone directories.

Personnel, Training, and Labor Relations Specialists

(D.O.T. 079.127-010; 099.167-010; 166.067-010, .117-014, .167-010, -014, -022, -034, -038, -042, -046, .227-010, .267-014, -018, -022, -026; 169.107-010, .207-010, .367-010)

Nature of the Work

Attracting the best employees available and matching them to the jobs they can do best is important for the success of any organization. But many enterprises are too large to permit close contact between management and employees. Instead, personnel and labor relations specialists provide this link—helping management make effective use of employees' skills, and helping employees find satisfaction in their jobs and working conditions. Although some jobs in this field require only limited contact with people outside the office, most involve frequent contact. Dealing with people is an essential part of the job.

Personnel, training, and labor relations specialists concentrate on different aspects of employer-employee relations. *Personnel specialists* interview, select, and recommend applicants for job openings; stay abreast of rules and regulations pertaining to affirmative action and equal employment opportunity; and help develop policies on hiring and advancement. They also handle wage and salary administration, pensions and benefits, and employee assistance programs. *Training specialists* develop courses, workshops, and other programs tailored to the training needs of an organization and its employees. Trainers consult with managers and supervisors about specific training needs, prepare manuals and other materials for use in training sessions, and keep employees informed about training opportunities. "Labor relations" means union-management relations, and *labor relations specialists* work in unionized establishments, for the most part. They help company officials prepare for collective bargaining sessions, participate in contract negotiations, and handle labor relations matters that come up every day.

In a small organization, one person can handle all aspects of personnel administration. By contrast, the personnel department in a large firm is likely to include recruiters, interviewers, job analysts, benefits specialists, training specialists, and labor relations specialists. Personnel clerks and assistants handle routine tasks such as issuing forms, maintaining files, compiling statistics, and answering inquiries.

Personnel work often begins with the *recruiter*, (D.O.T. 166.267-026), who maintains contacts within the community and may travel extensively—usually to college campuses—to search for promising job applicants. Recruiters talk with applicants, and recommend those who appear qualified to fill vacancies. They may administer tests and check references. These workers need to be thoroughly familiar with the organization and its personnel policies to discuss wages, working conditions, and promotional opportunities with prospective employees. They also need to keep informed about equal employment opportunity (EEO) and affirmative action guidelines.

EEO representatives or affirmative action coordinators handle this area in large organizations. They investigate and resolve EEO grievances, examine corporate practices for possible violations, and compile and submit EEO statistical reports.

Job analysts (D.O.T. 166.267-018), sometimes called *compensation analysts*, do very exacting work. They collect and examine detailed information about job duties to prepare job descriptions. These descriptions explain the duties, training, and skills each job requires. Whenever a large organization introduces a new job or reviews existing ones, it calls upon the expert knowledge of the job analyst.

Establishing and maintaining a firm's pay system is the principal job of the *compensation manager* (D.O.T. 166.167-022). Assisted by staff specialists, compensation managers devise ways to ensure fair and equitable pay rates. They may conduct surveys to see how their rates compare with others and to see that the firm's pay scale complies with laws and regulations.

Training, or more broadly, human resource development, is a major specialization within personnel administration. Increasingly, management is coming to recognize that training offers a way of developing skills, enhancing productivity, and building loyalty to the firm. Training is widely accepted as a method of improving employee morale, but this is only one of the reasons for its growing importance. Other factors include the complexity of the work environment, the rapid pace of organizational and technological change, and the growing number of jobs that are in fields where new knowledge is constantly being generated. In addition, advances in learning theory have provided insights into how adults learn, and how training can be organized to be most effective for adults.

Training specialists (D.O.T. 079.127-010 and 166.167-014) are responsible for planning, organizing, and directing a wide range of training activities. Trainers conduct orientation sessions and arrange on-the-job training for new employees. They help rank-and-file workers maintain and improve their job skills and possibly prepare for jobs requiring greater skill. They help supervisors deal more effectively with employees. To prepare employees for future responsibilities, they may set up individualized training plans to strengthen skills or teach new ones. Training specialists in some companies set up programs designed to develop executive potential among employees in lower echelon positions.

Planning and program development is an important part of the training specialist's job. In order to identify and assess training needs within the firm, trainers may confer with managers and supervisors or conduct surveys. They also periodically evaluate training effectiveness.

Depending on the size, goals, and nature of the organization, there may be considerable differences in trainers' responsibilities and in the methods they use. Training methods currently in use include on-the-job training; "vestibule" schools in which shop conditions are dupliated for trainees prior to putting them on the shop floor; apprenticeship training; classroom training; programmed instruction, which may involve interactive videos, videodiscs, and other computer-aided instructional technologies; simulators; conferences; and workshops.

Employee-benefits managers (D.O.T. 166.117-014, -022) handle the company's employee benefits program, primarily its health insurance and pension plans. Expertise in designing and administering benefits programs continues to gain in importance as benefits administration becomes increasingly complex. Familiarity with health benefits is a top priority at present, as more and more firms search for ways to respond to the rising cost of health insurance for employees and retirees.

Corporate support for controlling health care costs has resulted in new roles and a broadened scope of activity for benefits specialists—some of whom work for consulting firms that specialize in this area. Companies have begun to redesign benefit packages in order to encourage employees to use less costly forms of health care, for example. Increasingly, benefits specialists need expert knowledge of health care delivery: Pre-admission screening, mandatory second opinions, and review of how benefits are used are examples of issues benefits specialists are currently dealing with. Another major activity is tracking and analyzing costs—determining how much health care the firm is paying for, what services employees and their dependents are getting for the money, and what accounts for differences in the use and cost of care.

In addition to health insurance and pension coverage, many firms offer their employees dental insurance, accidental death and disability insurance, auto insurance, homeowners' insurance, stock options, profit sharing, and thrift/savings plans. Benefits analysts and benefits administrators handle these programs and also may develop and coordinate services as diverse as van-pooling, child care, lunchrooms and company cafeterias, newsletters, and health promotion and physical fitness.

A growing number of firms provide employee counseling programs, often called employee assistance programs. Most often staffed by social workers or psychologists, these programs may be located in the personnel department, the medical department, or elsewhere within the firm. Some employee counseling programs are off-site and staffed entirely by consultants. Typically, worksite employee counseling starts with an alcholism program; expands to cover other major problems including drug abuse and emotional disorders; and eventually offers counseling for a wide range of personal as well as job-related concerns, including marital, family, legal, consumer, and financial problems. Career counseling may be provided as well. Some firms offer personal, financial, and second careers counseling for employees approaching retirement age.

Occupational safety and health programs are handled in various ways. In small companies especially, accident prevention and industrial safety are the responsibility of the personnel department—or of the labor relations specialist, if the union has a safety representative. Increasingly, however, a safety engineer or industrial hygienist is in charge of a separate safety department.

Labor relations specialists (D.O.T. 166.167-034) advise management on all aspects of union-management relations. When a collective bargaining agreement is up for negotiation, they provide background information for management's position, which requires familiarity with economic and wage data as well as extensive knowledge of labor law and collective bargaining trends. Although the director of labor relations or other top-ranking official representing the employer negotiates the agreement, the labor relations staff play an important role.

The labor relations staff interprets and administers the contract, particularly grievance procedures. Labor relations specialists might work with the union on seniority rights under the layoff procedure of the contract, for example, or meet with the union steward about a grievance. Doing the job well means staying abreast of current developments in labor law, including arbitration decisions, and maintaining continuing liaison with union officials.

Personnel specialists in government and those in large business firms do essentially the same kind of work, although there are some differences. Public personnel specialists deal with civil service employees whose jobs are strictly classified as to entry requirements, duties, and pay. Therefore much of the emphasis in public personnel work is on job analysis. Training and career development are growing in importance in the public sector, however, and union activity among government workers has created a need for labor relations specialists to handle negotiations, grievances, and arbitration cases for Federal, State, and local government agencies.

Working Conditions

Personnel work is office work. The work is performed in pleasant surroundings that are generally clean and quiet. Personnel and training specialists usually work a standard 35- to 40-hour workweek. Labor relations specialists, however, may work longer hours—particularly when contract agreements are being prepared and negotiated.

Although most personnel, training, and labor relations specialists work in the office, some travel extensively. Recruiters regularly attend professional meetings and visit college campuses to interview prospective employees.

Employment

Personnel, training, and labor relations specialists held about 198,000 jobs in 1984. Four out of five jobs were in private industry. Some personnel, training, and labor relations specialists work for labor unions. Others are employed by, or operate, management consulting firms that specialize in such areas as compensation, pensions and benefits, and training and staff development.

Approximately 41,000 personnel, training, and labor relations specialists worked for Federal, State, and local governments in 1984. They handled recruitment, interviewing, job classification, training, and related matters for the Nation's 16 million public employees: Police officers, firefighters, sanitation workers, teachers, hospital workers, and many others.

Training, Other Qualifications, and Advancement

Because of the diversity of duties and level of responsibility, the educational backgrounds of personnel, training, and labor relations specialists vary considerably. In filling entry level jobs, firms generally seek college graduates. Some employers prefer applicants who have majored in personnel administration or industrial and labor relations, while others look for college graduates with a technical or business background. Still others feel that a well-rounded liberal arts education is best.

Many colleges and universities have programs leading to a degree in personnel and labor relations. Others offer degree programs in personnel administration or personnel management. Some offer degrees or certificates in training and development. Depending on the school, preparation for a career in human resources development may be obtained in departments of business administration, education, instructional technology, organizational development, human services, communication, or public administration.

Because an interdisciplinary background is appropriate for work in this area, a combination of courses in the social sciences, behavioral sciences, and business is useful. Prospective personnel specialists might take courses in principles of management, organization dynamics, and human relations. Other relevant courses include business administration, public administration, psychology, sociology, political science, economics, and statistics. Courses in labor law, collective bargaining, labor economics, labor history, and industrial psychology provide a valuable background for the prospective labor relations specialist.

Graduate study in industrial or labor relations is becoming increasingly important for those seeking work in labor relations. A law degree seldom is required for entry level jobs, but many people responsible for contract negotiations are lawyers, and a combination of industrial relations courses and law is highly desirable. Some experienced in personnel work move into labor relations.

For many jobs in this field, previous experience is an asset; for some, it is essential. Personnel administration and human resource development require the ability to work with individuals as well as a commitment to organizational goals. They also demand skills that may be developed in many ways—selling, teaching, supervising, and volunteering, among others. In fact, the majority of personnel and labor relations jobs are filled by people previously employed in another occupation. This field offers clerical workers opportunities for advancement to professional positions. However, more responsible positions may be filled by experienced individuals from other fields including business, government, education, and the military. Social services administration provides a suitable background, too.

Personnel, training, and labor relations specialists should speak and write effectively and be able to work

Personnel specialist explains company procedures to a new employee.

with people of all levels of education and experience as part of a team. They must be patient to cope with conflicting viewpoints and emotionally stable to deal with the unexpected and the unusual. The ability to function under pressure is essential. Integrity, fair mindedness, and a persuasive, congenial personality are important qualities.

Entry level workers usually enter formal or on-the-job training programs where they learn how to classify jobs, interview applicants, or administer employee benefits. Next, they are assigned to specific areas in the personnel department to gain experience. Later, they may advance within their own company, transfer to another employer, or manage a major element of the personnel program—compensation, training, or EEO/affirmative action, for example.

Workers in the middle ranks of a large organization often leave for a more responsible job in a smaller organization. Exceptional employees may be promoted to director of personnel or labor relations. Others may join a consulting firm or go into private business. A Ph.D. is an asset for teaching, writing, or consulting work.

Job Outlook

The number of personnel, training, and labor relations specialists is expected to grow about as fast as the average for all occupations through the mid-1990's. Most growth will occur in the private sector as employers try to provide effective employee relations programs for an expanding and aging work force. Relatively little growth is anticipated in public personnel administration. As in virtually all occupations, most job openings will result from replacement needs.

Demand for personnel, training, and labor relations specialists is governed by the staffing needs of the firms where they work. A rapidly expanding business is likely to hire additional personnel specialists—either as permanent employees or consultants—while a business that is reducing its operations will require fewer personnel workers. In any particular firm, the size and the job duties of the personnel, training, and labor relations staff is determined by a variety of factors, including the firm's organizational philosophy and goals; the labor-intensity and skill profile of the industry; the pace of technological change; government regulations, collective bargaining agreements, and standards of professional practice; and labor market conditions.

Other factors stimulate demand for personnel, training, and labor relations specialists. Legislation setting standards in occupational safety and health, equal employment opportunity, and pensions has substantially increased the amount of recordkeeping, analysis, and report writing in the personnel area. Data gathering and analytical activities are bound to increase as employers continue to review and evaluate their personnel policies and programs. However, these activities probably will not generate many additional jobs because of the productivity gains associated with the automation of personnel and payroll information.

Corporate recognition of the importance of human resource development is expected to result in greater investment in job-specific, employer-sponsored training and retraining as a response to productivity concerns, the aging of the workforce, and technological advances that can suddenly leave large numbers of employees with obsolete skills.

Although the number of jobs in this field is projected to increase through the mid-1990's, the job market is likely to remain competitive, given the abundant supply of recent college graduates and experienced workers with suitable qualifications.

Earnings

Typical entry level jobs in the personnel field include job analyst, EEO representative, benefits analyst, and training specialist. These positions generally require a bachelor's degree but no experience. Salaries vary widely, and depend on the size and location of the firm as well as the nature of its business.

In the Federal Government, new graduates with a bachelor's degree generally started at about $13,800 a year in 1985. Those with a master's degree started at about $21,000.

In 1984, according to a survey conducted by Abbott, Langer, and Associates, the median salary for compensation analysts was $25,150; for benefits planning analysts, $23,989; for employee counselors, $26,712; for recruiters (professional/managerial), $26,460; and for personnel information specialists, $24,300. The median salary for EEO affirmative action managers was $35,000; for compensation and benefits managers, $33,417; for training and organizational development managers, $37,682; and for labor relations managers, $37,500.

According to a Bureau of Labor Statistics survey, average annual salaries of personnel directors in private industry ranged from $35,444 to $65,874 in 1984. Top personnel and labor relations executives in large corporations earned considerably more.

Related Occupations

All personnel, training, and labor relations occupations are closely related. Other workers who help people find jobs or help to make the work environment safe and pleasant include health and regulatory inspectors, occupational safety and health workers, employment counselors, rehabilitation counselors, college career planning and placement counselors, industrial engineers, psychologists, and sociologists. Several of these occupations are described elsewhere in the *Handbook*.

Sources of Additional Information

For general information on careers in personnel and industrial relations, write to:

American Society for Personnel Administration, 606 N. Washington St., Alexandria, Va. 22314.

Accreditation of generalists and specialists in the personnel and human resources field is offered through the Personnel Accreditation Institute. For information, contact:

Executive Director, Personnel Accreditation Institute, 606 N. Washington St., Alexandria, Va. 22314.

For a booklet on *Careers in Training and Development*, contact:

American Society for Training and Development, 600 Maryland Ave. SW., Suite 305, Washington, D.C. 20024.

Brochures describing a career with the National Labor Relations Board as a field examiner or attorney are available from:

Director of Personnel, National Labor Relations Board, 1717 Pennsylvania Ave. NW., Washington, D.C. 20570.

The Industrial Relations Research Association periodically publishes a list of academic programs in industrial relations in the *IRRA Newsletter*. For the current list, contact:

Industrial Relations Research Association, 7226 Social Science Building, 1180 Observatory Dr., Madison, Wis. 53706.

Purchasing Agents

(D.O.T. 162.117-018, -022 and -026; .157-030, -034, and -038; .167-030; 163.117-010; and 169.167-054)

Nature of the Work

If an organization does not have the right materials, supplies, or equipment when they are needed, its entire production process or workflow could be interrupted or halted. Purchasing agents, also called industrial buyers, see to it that the goods, materials, supplies, and services purchased for internal use by the organization are of suitable quality, sufficient quantity, at the right price, and available when needed. Agents in industry and government buy raw materials, machinery, parts and components, furniture, business machines, vehicles, and office supplies. Some, called media buyers, purchase advertising time and space. Buyers who purchase merchandise for resale, rather than for internal use, are described in the statement on buyers, retail and wholesale trade, elsewhere in the *Handbook*.

Purchasing agents buy supplies when the stock on hand reaches a predetermined reorder point, when a department in the organization requisitions items it needs, or when market conditions are especially favorable. Purchasing agents increasingly use computers to keep track of inventory levels, to process routine orders, and to determine when to make purchases. Computers are also used to maintain bidders' lists, to record the history of vendor performance, and to issue purchase orders. Because agents often can purchase from many sources, their main job is selecting the supplier who offers the best combination of quality, service, and price.

Purchasing agents use a variety of means to choose suppliers. They compare listings in catalogs, directories, and trade journals. They meet with salespersons to discuss items to be purchased, examine samples, and attend demonstrations of products and equipment. Frequently, agents invite suppliers to bid on large orders and then select the lowest bidder among those who meet purchasing and delivery date requirements.

Sometimes, purchasing agents negotiate for custom-made products or specialized services. Increasingly, they enter into long-term contracts with vendors to guarantee future supplies of goods at the negotiated price. In order to make this long-term commitment, purchasing agents must carefully evaluate vendors and take into account the future needs of the organization. Needless to say, purchasing agents must thoroughly understand the characteristics and functions of the items they purchase. In some cases, such as computer equipment, this requires considerable technical knowledge. After placing an order, the purchasing agent checks periodically to insure prompt delivery.

Purchasing agents develop good business relationships with suppliers in order to attain cost savings, favorable payment terms, quick delivery on emergency orders, or help in obtaining scarce materials. Agents also work closely with other employees in their own organization. For example, they may discuss design of custom-made products with company engineers, defects in purchased goods with quality control technicians, or shipment problems with workers in the shipping department.

Purchasing agents' functions may differ according to the type and size of the organization. In a large firm, agents usually specialize in a commodity or group of commodities—for example, steel, lumber, cotton, or petroleum products. In smaller organizations, agents generally buy a wider range of goods, such as all raw materials or all office supplies, furniture, and business machines. Many have responsibility for arranging custodial, waste disposal, and other contractual services. Purchasing managers usually supervise a group of purchasing agents handling a number of related goods and services.

Working Conditions

Purchasing agents generally work a standard 35- to 40-hour week. Some overtime may be necessary if, for example, the supply of critical materials runs short. Although they spend most of their time in the office, some travel to suppliers, seminars, or trade shows.

Employment

Purchasing agents held about 189,000 jobs in 1984. More than 40 percent of all the jobs were located in manufacturing, primarily in the machinery and transportation equipment industries. Construction companies, hospitals, schools, and advertising firms also are large employers of purchasing agents. Government agencies, primarily in the Federal sector, provided over one-seventh of all jobs. Because of its complex and extensive purchasing requirements, the Department of Defense employs about 70 percent of all purchasing agents in the Federal Government. Other important Federal employers are the Department of Agriculture, the General Services Administration, and the Veterans Administration.

Many purchasing agents work in organizations that have fewer than

Purchasing agents often discuss requirements with officials from different departments in the firm.

five employees in the purchasing department. Large business firms and government agencies, however, have much larger purchasing departments; some employ as many as 100 specialized purchasing agents.

Training, Other Qualifications, and Advancement

Although there are no universal educational requirements for entry level jobs, most large organizations require a college degree and prefer applicants with a master's degree in business administration or management. Companies that manufacture machinery or chemicals may prefer applicants with a technical background, such as engineering or science, while other companies hire business administration majors as trainees. Courses in purchasing, accounting, economics, and statistics are helpful. Familiarity with computers also is desirable. Many colleges and vocational institutes offer courses in purchasing; a few colleges offer a degree in this field.

Some small companies require a bachelor's degree; many others, however, hire graduates of associate degree and vocational education programs in purchasing for entry level jobs. They also may promote clerks or technicians in the purchasing department. Regardless of the size of an organization, however, a college degree is becoming increasingly important for advancement to management positions.

Whatever their educational background, beginning purchasing agents are enrolled in company training programs and spend considerable time learning about company operations and purchasing procedures. They work with experienced buyers to learn about commodities, prices, suppliers, and negotiating techniques. They may be assigned to production planning to learn about the purchasing system, inventory records, and storage facilities.

Junior agents purchase standard and catalog items. As they gain knowledge and experience, they may be promoted to purchasing agent, then to senior purchasing agent. Senior agents purchase highly complex, usually custom-made items.

Purchasing agents must be able to analyze the technical data in suppliers' proposals, make buying decisions, and spend large amounts of money responsibly. The job requires the ability to work independently and a good memory for details. In addition, a purchasing agent must be able to get along well with people to balance the needs of personnel in the organization with budgetary constraints and to negotiate with suppliers. An agent may work with lawyers, contract administrators, and engineers and scientists when involved in complex procurements.

A qualified purchasing agent can become an assistant purchasing manager in charge of a group of purchasing agents and then advance to purchasing manager, director or vice president of purchasing, or director or vice president of materials management. At the top levels, duties may overlap into other management functions such as production, planning, and marketing.

This occupation is becoming increasingly professionalized and specialized. Continuing education is essential for advancement. Most agents participate in seminars offered by professional societies and take college courses in purchasing. Certification enhances one's chances for top management positions. In private industry, the recognized mark of experience and professional competence is the designation Certified Purchasing Manager (CPM). It is conferred by the National Association of Purchasing Management, Inc., upon candidates who pass four examinations and meet educational and experience requirements. In government, the indications of professional competence are the designations Professional Public Buyer (PPB) and Certified Public Purchasing Officer (CPPO), conferred by the National Institute of Governmental Purchasing, Inc. The PPB is earned by passing a two-part written examination and meeting educational and experience requirements. A candidate must meet more stringent basic requirements and pass a three-part written exam and an interview assessment to earn the CPPO.

As more and more purchasing is conducted on a long-term basis, both private and public purchasing agents are specializing in contract purchasing. The National Contract Management Association confers the designations Certified Associate Contract Manager (CACM) or Certified Professional Contract Manager (CPCM) upon those who meet educational and experience requirements and pass a written examination.

Job Outlook

Employment of purchasing agents is expected to increase about as fast as the average for all occupations through the mid-1990's as the volume of goods and services produced increases. Goods-producing firms will expand purchasing departments to handle the growing complexity of manufacturing processes and to help keep costs of production materials and supplies to a minimum. Many opportunities also should arise as service-producing organizations (hospitals, schools, and local and State governments) also recognize the importance of professional purchasers in reducing costs.

Most job openings, however, will continue to arise from the need to replace purchasing agents who leave their jobs. Many purchasing agents transfer to other occupations, often sales or managerial positions. Others retire or leave the labor force for other reasons.

Persons who have a master's degree in business administration and a bachelor's degree in purchasing, or in engineering, science, or business administration with courses in purchasing, should have the best opportunities. Graduates of 2-year programs in purchasing should continue to find good opportunities, especially in small firms.

Earnings

Median annual earnings for purchasing agents were slightly over $21,000 in 1984. The middle 50 percent earned between $16,500 and $30,000. The bottom 10 percent earned less than $13,000, and the top 10 percent earned more than $39,000. The average starting salary for purchasing agents in the private sector was $20,200 a year in 1984. Experienced workers earned between $24,700 and $30,600, and senior agents averaged $37,900.

In the Federal Government, beginning purchasing agents who had college degrees earned $14,390 or $17,824 in 1985, depending on scholastic achievement and experience. Purchasing agents in the Federal Government averaged $29,900 in 1984. Among State governments, earnings ranged from $11,000 for beginning purchasing agents to over $40,000 for chiefs of purchasing. Generally, local government salaries are somewhat lower. However, purchasing agents in some major metropolitan areas earn more than their State government counterparts.

Related Occupations

Other workers who negotiate and contract to purchase equipment, supplies, or other merchandise include retail and wholesale buyers, procurement services managers, and traffic managers.

Sources of Additional Information

Further information about careers in purchasing and certification is available from:

National Association of Purchasing Management, Inc., P.O. Box 418, Oradell, N.J. 07649.

National Institute of Governmental Purchasing, Inc., 115 Hillwood Ave., Falls Church, Va. 22046.

National Contract Management Association, 6728 Old McLean Village Dr., McLean, Va. 22101.

Underwriters

(D.O.T. 169.167-058)

Nature of the Work

Insurance companies assume billions of dollars in risks each year by transferring the risk of loss from their policyholders to themselves. Underwriters appraise and select the risks their company will insure. The underwriter must analyze information in insurance applications, reports from loss control consultants, medical reports, and actuarial studies (reports that describe the probability of insured loss) and then decide whether to issue a policy. An insurance company may lose business to competitors if the underwriter appraises risks too conservatively or it may have to pay more claims if the underwriting actions are too liberal. (The term "life underwriter" is increasingly used in referring to insurance sales workers; see the statement on insurance sales workers elsewhere in the *Handbook* for a discussion of that occupation.)

When deciding that an applicant is an acceptable risk, an underwriter may outline the terms of the contract, including the amount of the premium. Underwriters frequently correspond with policyholders, agents, and managers about policy cancellations or other requests for information. In addition, they sometimes accompany sales workers on appointments with prospective customers.

Most underwriters specialize in one of three major categories of insurance: Life, property and liability, or health. They further specialize in group or individual policies. The property and liability underwriter specializes by type of risk insured, such as fire, automobile, marine, or workers' compensation. In cases where casualty companies insure in a single "package" policy, covering various types of risks, the underwriter must be familiar with different lines of insurance. Some underwriters, called commercial account underwriters, handle business insurance exclusively. They often evaluate a firm's entire operation in appraising its insurance application.

An increasing proportion of insurance sales are being made through group contracts. A standard group policy insures all persons in a specified group through a single contract at uniform premium rates, generally for life or health insurance protection. The group underwriter analyzes the overall composition of the group to be sure that the total risk is not excessive. Another type of group policy provides members of a group—a labor union, for example—with individual policies reflecting their individual needs. These generally are casualty policies, such as those covering automobiles. The casualty underwriter analyzes the application of each group member and makes individual appraisals. Some group underwriters meet with union or employer representatives to discuss the types of policies available to their group.

Working Conditions

Underwriters have desk jobs that require no unusual physical activity. Their offices generally are comfortable and pleasant. Although some overtime may be required, the normal workweek is 35-40 hours. Underwriters occasionally may attend meetings away from home for several days.

Employment

Insurance underwriters held about 78,000 jobs in 1984. Most life insurance underwriters were in home offices in a few large cities, such as New York, San Francisco, Chicago, Dallas, Philadelphia, and Hartford.

Training, Other Qualifications, and Advancement

For beginning underwriting jobs, most large insurance companies seek college graduates who have a degree in liberal arts or business administration, but a major in almost any field provides a good general background. Some small companies hire persons without a college degree for underwriter trainee positions. In addition, some high school graduates who begin as underwriting clerks may be trained as underwriters after they demonstrate an aptitude for the work.

Underwriters evaluate risk and determine what policies their company will insure.

Underwriter trainees begin by evaluating routine applications under the close supervision of an experienced risk appraiser. They study claim files to become familiar with factors associated with certain types of losses. As they develop the necessary judgment, they are assigned policy applications that are more complex and have a greater face value.

Continuing education is necessary for the underwriter to advance. Insurance companies generally pay tuition for underwriting courses that their trainees successfully complete; some also offer salary increases. Independent study programs are available through the American Institute of Property and Liability Underwriters, the American College of Life Underwriters, the Academy of Life Underwriters, the Health Insurance Association of America, the Insurance Institute of America, and the Life Office Management Association. Experienced underwriters can qualify as a "fellow" of the Academy of Life Underwriters by passing a series of examinations and completing a paper on a topic in the underwriting field. Examinations are given by the Institute of Home Office Underwriters and the Home Office Life Underwriters Association. Designation as a "fellow" is recognized as a mark of achievement in the underwriting field.

Underwriting can be a satisfying career for persons who like working with detail and enjoy evaluating information. In addition, underwriters must be able to make prompt decisions and communicate effectively. They must also be imaginative and aggressive, especially when they have to get information from outside sources.

Experienced underwriters who complete courses of study may advance to chief underwriter or underwriting manager. Some underwriting managers are promoted to senior managerial jobs.

Job Outlook

Employment of underwriters is expected to rise faster than the average for all occupations through the mid-1990's as insurance sales continue to expand. Most job openings, however, are expected to result from the need to replace underwriters who transfer to other occupations, retire, or stop working for other reasons.

A number of factors underlie the expected growth in the volume and complexity of insurance and the resulting need for underwriters. Over the next decade, many more workers will enter the 25-54 age group. People in this age group have the greatest need for life and health insurance. They also need protection for homes, automobiles, and other valuables. A growing demand for insurance coverage for working women is also expected. Growing security consciousness should also contribute to demand for more insurance protection. New or expanding businesses will need protection for new plants and equipment, insurance for workers' compensation, and product liability. Competition among insurance companies and changes in regulations affecting investment profits also are expected to increase the need for underwriters. The increasing importance of employee benefits should also result in more opportunities in this field.

Since insurance is usually regarded as a necessity regardless of economic conditions, underwriters are unlikely to be laid off during a recession.

Earnings

According to a survey of property and liability insurance companies, personal lines (noncommercial) underwriters earned a median salary of $21,500 a year in 1984, while commercial lines underwriters earned $21,200 a year. Senior personal lines underwriters received a median salary of $27,000, while senior commercial lines underwriters earned $25,600 a year. Underwriting supervisors earned about $31,000 while underwriting managers earned about $37,000 a year in 1984.

Most insurance companies have liberal vacation policies and other employee benefits. Almost all insurance companies provide employer-financed group life and retirement plans.

Related Occupations

Underwriters make decisions on the basis of financial data. Other workers with the same type of responsibility include auditors, loan officers, credit managers, and real estate appraisers.

Sources of Additional Information

General information about a career as an insurance underwriter is available from the home offices of many life insurance and property and liability insurance companies. Information about career opportunities as an underwriter also may be obtained from:

American Council of Life Insurance, 1850 K St. NW., Washington, D.C. 20006.

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

Alliance of American Insurers, 1501 Woodfield Rd., Suite 400 W., Schaumburg, Ill. 60195.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

Wholesale and Retail Buyers

(D.O.T. 162.157-018 and -022)

Nature of the Work

Buyers purchase, for resale, the best available merchandise at the lowest possible prices and expedite the delivery of goods from the producer to the consumer. The responsibilities of buyers vary by industry and product and range from the mundane to the glamorous. For example, wholesale grocery buyers may spend many hours deciding which brand of cereal should be promoted in the grocery stores they supply. In sharp contrast, apparel buyers in department stores may attend a fashion show in Paris and buy thousands of dollars worth of evening dresses at one time.

Wholesale and retail buyers are integral parts of a complex system of production, distribution, and merchandising that caters to the vast variety of consumer needs and desires. Wholesale buyers purchase goods directly from manufacturers or from other wholesale firms for resale to retail firms or to commercial establishments and other institutions. Retail buyers purchase goods from wholesale firms or directly from manufacturers for resale to the public. (Information about purchasing agents—buyers who purchase goods for internal use by their employing firm—can be found elsewhere in the *Handbook.*)

Wholesale buyers must be familiar with the characteristics of the many commodities they purchase from both domestic and foreign manufacturers. They must supply, in a timely and cost-effective manner, possibly hundreds of institutional buyers and retail purchasers who may be located throughout the Nation. These retail outlets may range in size from giant discount or department store chains to small "mom and pop" stores. This requires careful assessment of manufacturers' productive capacity and the minimum inventory level necessary for the wholesaler to promptly fill current and future orders from retailers and other commercial firms. Wholesale buyers often consult with retail buyers, who are in closer contact with the buying public, to anticipate changes in consumer preferences.

Retail buyers must know what motivates consumers to buy. Before ordering merchandise, they study market research reports and past sales records to determine which products are in demand. They keep informed about changes in existing products and the development of new ones, and also analyze economic conditions and examine industry and trade publications.

Retail buyers must be familiar with the many manufacturers and wholesale distributors in their industry. Buyers must be able to assess the resale value of goods after a brief inspection and make purchase decisions quickly. They discuss merchandising problems with wholesale buyers and store executives and discuss sales promotions with advertising personnel. They consult with assistant buyers and sales persons who are in daily contact with retail customers. Retail buyers may direct assistants who handle routine functions such as verifying shipment orders and monitoring inventory levels.

Technical advances in computers and other business equipment have improved buyers' efficiency. For example, computers not only give wholesale buyers instant access to the specifications of thousands of commodities, their inventory records, and their retailers' purchase records, but also greatly speed up the selection and ordering of merchandise directly from the manufacturer. This expedites the distribution of merchandise and decreases inventory storage and costs. Computers also have taken over some of the routine tasks of retail buyers, enabling them to concentrate on more complex merchandising functions. For example, cash registers connected to a computer, known as point-of-sale terminals, allow retail chains to maintain centralized, up-to-the-minute sales and inventory records. Moreover, retailers often are linked through electronic purchasing systems to wholesale distributors or to their own company's corporate headquarters. These complex networks allow retailers to reorder goods electronically when supplies are low.

Working Conditions

Buyers often operate under great pressure since wholesale and retail trade establishments are highly competitive. They work in comfortable, well-lighted offices at stores or in corporate headquarters. Anticipating customer's preferences and ensuring that goods are in stock when they are needed require resourcefulness, good judgment, and self-confidence. Buyers also must be able to make decisions quickly and take risks.

Buyers frequently work more than a 40-hour week because of special sales and conferences. They may have to work evenings and weekends to complete work on time. Substantial traveling is required; most buyers spend several days a month on the road. However, many successful buyers feel that the stimulation and excitement of the job more than make up for the long hours and emotional strain.

Employment

Wholesale and retail buyers held about 229,000 jobs in 1984. About two-thirds of the jobs were in retail firms. Although buyers work in all parts of the country, most are in major metropolitan areas, where wholesale and retail stores are concentrated.

Training, Other Qualifications, and Advancement

Familiarity with merchandise and with wholesaling and retailing practices is important for buyers, and many persons with such experience transfer into this occupation. High school and postsecondary marketing and distributive education programs can launch careers in wholesaling and retailing that lead eventually to a buyer's position. (More information about marketing and distributive education appears in the statement on retail trade sales workers elsewhere in the *Handbook*.) Vocational schools, technical institutes, and community colleges offer postsecondary training that prepares students for careers in merchandising. Many colleges and universities offer associate degree or bachelor's degree programs in marketing and purchasing. An increasing number of employers prefer applicants who have a college degree.

Courses in merchandising or marketing may help in getting started in wholesaling and retailing. However, most employers accept college graduates from any field of study for buyer trainee programs, which combine classroom instruction in merchandising and purchasing with short rotations to various jobs in the store. This training introduces the new worker to store operations and policies and to the fundamentals of merchandising and management.

Most trainees begin by selling merchandise, supervising sales workers, checking invoices on material re-

Buyers frequently call suppliers to obtain information about products.

ceived, and keeping account of stock on hand, although widespread use of computers in both wholesale and retail trade has simplified many of these tasks. They gradually assume buying responsibilities—usually working as assistant buyers for at least a year or two before becoming buyers. Experienced buyers may advance to merchandise manager; some advance to executive jobs such as general merchandise manager for distributors, department stores, or chain stores.

Membership in professional and trade associations is helpful in keeping abreast of improvements and changes in industry products and practices and can facilitate advancement to more responsible positions.

Persons who wish to become buyers should be good at planning and decisionmaking and have an interest in merchandising. Leadership ability and communications skills are needed to supervise sales persons and assistant buyers and to deal effectively with manufacturers' representatives and store executives. Familarity with computers also is becoming increasingly important. Because of the fast pace and pressure of their work, buyers need physical stamina and emotional stability.

Job Outlook

Employment of buyers is expected to grow about as fast as the average for all occupations through the mid-1990's, as the wholesale and retail trade industries expand in response to a growing population and higher personal incomes. Most job openings, however, will result from replacement needs, because many experienced buyers transfer to other occupations such as sales or managerial positions or leave the labor force temporarily to assume household responsibilities.

Somewhat offsetting increased demand for buyers will be productivity gains resulting from the increased use of computers to control inventory, maintain records, and to reorder merchandise. The number of qualified jobseekers will continue to exceed the number of openings because merchandising attracts many college graduates. Prospects are likely to be best for qualified applicants who enjoy the competitive, fast-paced nature of merchandising.

Earnings

Median annual earnings of buyers were $19,500 is 1984. Most earned between $15,100 and $28,500 a year. The lowest 10 percent averaged less than $10,700, while the top 10 percent earned more than $38,000. A buyer's income depends upon the amount and type of product purchased, the employer's sales volume and, to some extent, the buyer's seniority. Buyers for large wholesale distributors and for mass merchandisers such as discount or large chain department stores are among the most highly paid.

Buyers often earn cash bonuses based on their performance. In addition, many firms have incentive plans, such as profit sharing and stock options.

Related Occupations

Workers in other occupations who need a knowledge of marketing and the ability to assess consumer demand are sales managers, comparison shoppers, manufacturers' sales representatives, insurance sales agents, wholesale trade sales representatives, and travel agents.

Sources of Additional Information

General information about a career in retailing is available from:

National Mass Retailing Institute, 570 Seventh Ave., New York, N.Y. 10018.

Information on schools that teach retailing is available from your State Director of Vocational Education and from:

National Association of Trade and Technical Schools, 2021 K St. NW., Washington, D.C. 20006.

Engineers, Surveyors, and Architects

Nature of the Work

Engineers, surveyors, and architects do planning and design. Engineers design machines, processes, systems, and structures. Surveyors measure and lay out land and building boundaries. Architects design buildings and other structures, as well as outdoor areas.

Architects, engineers, and surveyors often work together on building projects. Architects design the building, concentrating on the visual appearance as well as the needs of owners and occupants; engineers design the building's mechanical, heating, and electrical systems; and surveyors lay out the building's boundaries and the boundaries of the land it occupies.

Engineers apply scientific and mathematical theories and principles to solve practical technical problems. Most work in one of the more than 25 specialties recognized by professional societies. Electrical, mechanical, civil, industrial, chemical, and aerospace engineering are the largest. Although many engineers work in design and development, others work in testing, production, operations, and maintenance.

Architects also apply scientific and mathematical theories and principles to design and construct buildings which are esthetically appealing and safe, and which meet the needs of their client.

Surveyors use mathematical and scientific principles to measure and lay out land areas and establish boundaries. They also research deeds, write legal descriptions of land, and collect information for maps and charts.

Training, Other Qualifications, and Advancement

The generally accepted standard for engineers is a bachelor's degree in engineering, although those with degrees in natural science or mathematics may sometimes qualify as engineers. Surveyors usually qualify for their work with a combination of postsecondary school courses and on-the-job training. Some obtain a junior college degree in surveying. A bachelor's degree in architecture is necessary to become an architect. To offer services to the public, architects, engineers, and surveyors must also have several years' work experience and pass a licensing examination.

Job Outlook

All occupations in this group, except mining and nuclear engineers, are expected to grow at least as fast as the average for all occupations through the mid-1990's due to expected higher levels of investment in industrial plants and equipment as well as in office buildings and other construction projects. The employment of engineers also will increase due to expected higher defense expenditures.

Employment opportunities for engineers with degrees in engineering are expected to be good through the mid-1990's. Employment of engineers is expected to grow much faster than the average for all occupations through the mid-1990's, although growth rates for individual engineering specialties vary. Employment of surveyors is expected to increase as fast as average; employment of architects is expected to increase faster than average due to expected increases in construction activity. However, opportunities for both surveyors and architects may vary from year to year as construction activity fluctuates.

Architects

(D.O.T. 001.061-010 and .167-010)

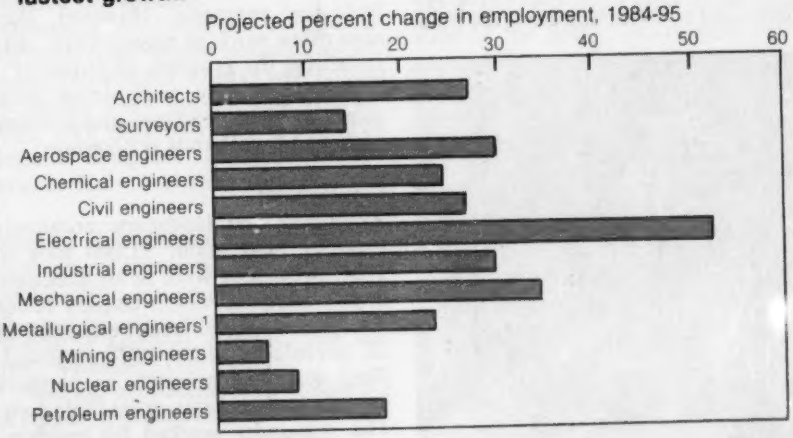
Nature of the Work

Designing a building involves far more than planning an attractive shape and exterior. Buildings must also be functional, safe, and economical and must suit the needs of the people who use them. Architects take all these things into consideration when they design buildings.

Architects provide a wide variety of professional services to individuals and organizations planning a building project. They are involved in all phases of development, from the initial discussion of general ideas with the client through construction. Their duties require a variety of skills—design, engineering, managerial, and supervisory.

The architect and client first discuss the purposes, requirements, and cost

Electrical and mechanical engineers are projected to have the fastest growth.



[1] Includes ceramic and materials engineers.

SOURCE: Bureau of Labor Statistics

of a project. Based on the discussions, the architect prepares a program—a report specifying the requirements the design must meet. The architect then prepares carefully scaled drawings presenting ideas for meeting the client's needs.

After the initial proposals are discussed and accepted, the architect develops final construction documents that incorporate changes required by the client. These documents show the floor plans, elevations, building sections, and other construction details. Accompanying these are drawings of the structural system, air-conditioning, heating, and ventilating systems, electrical systems, plumbing, and landscape plans. Architects also specify the building materials and, in some cases, the interior furnishings. In developing designs, architects follow building codes, zoning laws, fire regulations, and other ordinances, such as those that require easy access by handicapped persons.

Throughout the planning stage, the architect may make changes to satisfy the client, who may decide that the design is too expensive or may propose additions to the original plan. The architect may also assist the client in obtaining bids, selecting a contractor, and negotiating the construction contract. As construction proceeds, the architect visits the building site to ensure that the contractor is following the design, using the specified materials, and that the quality of work meets the specified standards. The job is not complete until all construction is finished, required tests are made, and construction costs are paid.

Most architects work in architectural firms or are self-employed.

Architects design a wide variety of structures, such as office buildings, churches, hospitals, houses, and airports. They also design multibuilding complexes for urban renewal projects, college campuses, industrial parks, and new towns. Besides designing structures, architects may select building sites, prepare cost and land-use studies, and conduct long-range planning for land development.

On large projects or in large architectural firms, architects often specialize in one phase of the work, such as design or administering construction contracts. This often requires working with engineers, urban planners, interior designers, landscape architects, and others.

The work of landscape architects (D.O.T. 001.061-018) is closely related to that of architects, although they are usually considered separate occupations. Landscape architects plan the best use of land areas for such projects as parks, airports, golf courses, highways, factories, shopping malls, and housing developments. They use trees and shrubs to create a pleasant environment and design walkways and lighting. They advise on potential land uses, analyze natural features of a site, and work with architects to harmonize buildings with their surroundings.

Working Conditions

Architects generally work in a comfortable environment. Most of their time is spent in offices advising clients, developing reports and drawings, and working with other architects and engineers. However, they also often work at construction sites reviewing the progress of projects.

Architects may work under great stress to meet deadlines and working nights and weekends is common.

Employment

Architects and landscape architects together held about 93,000 jobs in 1984. Most jobs were in architectural firms—many of which employ fewer than five workers. About one-third of all architects were self-employed. They practiced privately as partners in architectural firms or on their own. The remainder worked for builders, real estate developers, or other businesses that have large construction programs and for government agencies responsible for housing, planning, or community development such as the Departments of Defense, Interior, Housing and Urban Development, and the General Services Administration.

A large proportion of architects work in New York, Chicago, Los Angeles, Boston, and Washington, where many large architectural firms are located. Increasing numbers of architects are finding employment in rapidly growing areas, especially in the South and Southwest.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require individuals to be registered (licensed) before they may call themselves architects or contract for providing architectural services. To qualify for the registration examination, a person generally must have at least a Bachelor of Architecture degree from a program accredited by the National Architectural Accrediting Board and 3 years of acceptable experience in an architect's office. In many States, the experience must be in the Intern Architect Development Program, an apprenticeship program for architects. As a substitute for the professional degree in architecture, a few States still accept other combinations of formal education and experience (usually much more than 3 years) for admission to the registration examination, but this route to a license is being rapidly eliminated. Many architecture school graduates work in the field even though they are not registered. However, a registered architect is required to take legal responsibility for all work.

In 1985, the National Architectural Accrediting Board had accredited the programs of 92 schools offering professional degrees in architecture. Most of these schools offer either a 5-year curriculum leading to a Bachelor of Architecture degree or a 6-year curriculum leading to a Master of Architecture degree. Students also may transfer to professional degree programs after completing a 2-year junior or community college program in architecture. Many architecture schools also offer graduate education for those who already have a first professional degree. Although such graduate education is not essential for practicing architects, it is desirable for those engaged in specialties or in research and teaching. A typical college architecture program includes courses in architectural history and theory, design, graphics, engineering, and urban planning, as well as in English, mathematics, physics, economics, computer science, and the humanities.

Persons planning a career in architecture should have some artistic ability, at least to the extent of being able to make reasonable freehand sketches. They should have a capacity for solving technical problems and should be able to work independently. They also must be prepared to work in a competitive environment where leadership and ability to work with others are important. Flexibility and patience are needed when clients reject plans or request changes after final plans are developed. Students who work for architects, engineers, or building contractors during summer vacations can gain useful experience.

New graduates usually begin in architectural firms, where they prepare architectural drawings and make models of structures under the direction of a registered architect. They also may design; administer construction contracts; do research on building codes and materials; or write specifications for building materials, the method of installation, the quality of finishes, and many other related details. Graduates with degrees in architecture also enter other related fields such as graphic, interior, or industrial design, urban planning, civil engineering, or construction.

In large firms, architects may advance to supervisory or managerial positions. Some architects become partners in established firms. Often, however, the architect's goal is to have his or her own firm.

Job Outlook

Employment of architects is expected to rise faster than the average for all occupations through the mid-1990's. Demand for architects is highly dependent upon the level of construction, particularly of nonresidential structures such as office buildings, factories, and shopping facilities. Rapid growth in this area is expected. However, construction is sensitive to cyclical changes in the economy. During recessions, architects face competition for job openings or clients and layoffs may occur. Furthermore, regardless of economic conditions, there will continue to be competition for jobs in the most prestigious firms which offer good potential for career advancement. Although the increasing use of computer technologies such as computer-aided design increases efficiency, employment is not expected to be much affected because computer technologies are being used to make more and better designs rather than to reduce the need for architects.

Although employment is expected to rise faster than the average for all occupations through 1995, most job openings are expected to arise as architects transfer to other occupations or leave the labor force. However, the number of job openings for architects is small because the occupation is small and few architects transfer to other fields.

Earnings

The median annual earnings for salaried architects who worked full time were about $28,600 in 1984. Most earned between $20,000 and $37,000. The top 10 percent earned more than $40,000 and the lowest 10 percent, less than $15,000.

Architects who are partners in well-established architectural firms or solo practitioners generally earn much more than their salaried employees, but their income may fluctuate due to changing business conditions. Architects may have difficulty getting established in their own practices and may go through a period when their expenses are greater than their income.

In 1984, the average salary for architects working in the Federal Government was about $35,600.

Related Occupations

Architects are concerned with the design and construction of buildings and related structures. Others who engage in similar work are building contractors, civil engineers, urban planners, interior designers, industrial designers, drafters, and surveyors.

Sources of Additional Information

General information about careers in architecture can be obtained from:

Director, Education Programs, The American Institute of Architects, 1735 New York Ave. NW., Washington, D.C. 20006.

Specific questions on education for a career in architecture should be addressed to:

The Association of Collegiate Schools of Architecture, Inc., 1735 New York Ave. NW., Washington, D.C. 20006.

Information about licensing and examination can be obtained from:

The National Council of Architectural Registration Boards, 1735 New York Ave. NW., Suite 700, Washington, D.C. 20006.

For information about careers in landscape architecture, contact:

American Society of Landscape Architects, 1733 Connecticut Ave. NW., Washington, D.C. 20009.

Surveyors

(D.O.T. 018.167-010, -014, -018, -026 and -034 through -050, .261-018, -022, and -026, and .262-010)

Nature of the Work

Surveyors establish official land and water boundaries, write descriptions of land for deeds, leases, and other legal documents, measure construction and mineral sites, and collect information for and prepare maps and charts. Surveyors may also coordinate findings with engineers and architects.

Land surveyors manage one or more survey parties engaged in measuring distances, directions, and angles between points and elevations of points, lines, and contours on the earth's surface. They plan the fieldwork, select survey reference points, and determine the precise location of natural and constructed features of the survey project area. They research legal records and look for evidence of previous boundaries. They record the results of the survey, verify the accuracy of data, and prepare plats, maps, and reports.

A typical survey party is made up of the *party chief* and one to six survey technicians and helpers. The party chief leads the day-to-day work activities of the party. *Instrument assistants* adjust and operate surveying instruments such as the theodolite (used to measure horizontal and vertical angles) and electronic distance measuring (EDM) equipment. These workers also compile notes, sketches, and record the data obtained from using these instruments into computers.

Geodetic surveyors use special high-accuracy techniques, including satellite observations, to measure large areas of the earth's surface. *Geophysical prospecting surveyors* mark sites for subsurface exploration, usually petroleum related. *Marine surveyors* survey harbors, rivers, and other bodies of water to determine shorelines, topography of the bottom, depth, and other features.

Photogrammetrists prepare maps and drawings by measuring and interpreting aerial photographs, using analytical processes and mathematical formulas. Photogrammetrists are able to make detailed maps of areas that are inaccessible or difficult to survey by other methods. *Mosaicists* and *map editors* help develop and verify map content from aerial photographs and other reference sources.

A closely related occupation that uses surveying techniques is geodesist. (The work of geodesists is described in the statement on geologists, geophysicists, and oceanographers elsewhere in the *Handbook*.)

Working Conditions

Surveyors usually work an 8-hour day 5 days a week. Sometimes they work longer hours during the summer months when weather and light conditions are most suitable for field work.

The work of surveyors is active and sometimes strenuous. Surveyors often stand for long periods and walk long distances or climb hills with heavy packs of instruments and equipment. They also are exposed to all types of weather. Occasionally, they must commute long distances or find temporary housing near the survey site.

Surveyors spend considerable time on office duties, such as planning surveys and preparing reports, computations, and maps. Most computations and map drafting are done by using a computer.

Surveyors use advanced instruments to measure angles and distances.

Employment

Surveyors held about 44,000 jobs in 1984. Engineering, architectural, and surveying firms employ nearly one-half of all surveyors. Federal, State, and local government agencies employ about one-fourth. Major Federal Government employers are the U.S. Geological Survey, the Bureau of Land Management, the Army Corps of Engineers, the Forest Service, the National Ocean Survey, and the Defense Mapping Agency. Most surveyors in State and local government agencies work for highway departments and urban planning and redevelopment agencies. Construction firms, oil and gas extraction companies, and public utilities also employ surveyors. About 5,000 surveyors were self-employed.

Training, Other Qualifications, and Advancement

Most persons prepare for surveying work by combining postsecondary school courses in surveying with extensive on-the-job training. Some prepare by obtaining a college degree because some States now require a 4-year degree to be licensed as a surveyor. A few 4-year colleges offer bachelor's degrees specifically in surveying, while many others offer several courses in the field. Junior and community colleges, technical institutes, and vocational schools offer 1-, 2-, and 3-year programs in surveying technology.

High school students interested in a career in surveying should take courses in algebra, geometry, trigonometry, drafting, mechanical drawing, and computer science.

High school graduates with no formal training in surveying usually start as a member of a survey crew. After several years of on-the-job experience and formal training in surveying—either in an institutional program or from a correspondence school—workers may advance to survey technician, then to party chief, and finally to licensed surveyor.

Beginners with postsecondary school training in surveying can generally start as technicians. After gaining experience, they may advance through the technician ranks to party chief or become a licensed surveyor. Promotions to higher level positions often are based on written examinations as well as experience.

Photogrammetrists usually have a bachelor's degree in engineering or a physical science. Most photogrammetry technicians have had some specialized postsecondary school training.

All 50 States license land surveyors. Requirements for licensure vary among the States. Generally, the quickest route to licensure is a combination of 4 years of college, 2 to 4 years of experience, and passing the State licensing exam. As a prerequisite to licensure, some States now require a bachelor's degree in surveying or in a closely related field such as civil engineering or forestry with courses in surveying. A few States allow such graduates to take the licensing examination without experience in the field. In most States, however, persons without a degree may qualify to take the licensing exam after 5 to 12 years of surveying experience.

Surveyors should have the ability to visualize objects, distances, sizes, and other abstract forms. Also, because mistakes can be very costly, surveyors must make mathematical calculations accurately while paying close attention to the smallest detail. Leadership qualities are important for surveyors who supervise others.

Members of a survey party must be in good physical condition to work outdoors and carry equipment over difficult terrain. They also need good eyesight, coordination, and hearing to communicate over great distances by hand or voice signals.

Job Outlook

Employment of surveyors is expected to grow about as fast as the average for all occupations through the mid-1990's. In addition to openings arising from growth in the demand for these workers, many will result from the need to replace those who transfer to other occupations or leave the labor force.

The anticipated growth in construction should create additional jobs for surveyors who lay out streets, shopping centers, housing developments, factories, office buildings, and recreation areas. Construction and improvement of the Nation's roads and highways also should create new surveying positions. However, employment may fluctuate from year to year because construction activity is highly sensitive to changes in economic conditions.

Some growth also may occur in other related areas of surveying.

Earnings

In 1985, high school graduates with little or no training or experience earned about $10,500 annually at entry level jobs on survey crews with the Federal Government. Those with 1 year of related postsecondary training earned $11,460. Those with an associate degree that included courses in surveying generally started as instrument assistants with an annual salary of $12,860. The average annual salary for surveying technicians in 1984 was $15,900. In 1985, persons starting as land surveyors with the Federal Government earned $14,390 or $17,825 a year, depending on their qualifications. The average annual salary for land surveyors in 1984 was $28,500.

Limited information indicates that salaries for surveyors and surveying technicians in private industry are generally comparable to those in the Federal service.

Related Occupations

Other occupations concerned with accurate measurement and delineation of land areas, coastlines, and natural and constructed features include cartographers, cartographic technicians, and geodesists.

Sources of Additional Information

Information about career opportunities, licensure requirements, and schools that offer training in surveying is available from:

American Congress on Surveying and Mapping, 210 Little Falls St., Falls Church, Va. 22046.

General information on careers in photogrammetry is available from:

American Society for Photogrammetry and Remote Sensing, 210 Little Falls St., Falls Church, Va. 22046.

Engineers

The work of engineers has made it possible to communicate by telephone, radio, and TV; to travel in space; and to prolong life. Future accomplishments could be increased energy supplies, computers with artificial intelligence, and a manned space station.

This section, which contains an overall discussion of engineering, is followed by separate statements on 10 branches of the profession—aerospace; chemical; civil; electrical and electronics; industrial; mechanical; metallurgical, ceramic, and materials; mining; nuclear; and petroleum engineering.

Nature of the Work

Engineers apply the theories and principles of science and mathematics to the economical solution of practical technical problems. Often their work is the link between a scientific discovery and its application. Engineers design machinery, products, systems, and processes for efficient and economical performance. They develop electric power, water supply, and waste disposal systems. They design industrial machinery and equipment for manufacturing goods, and heating, air-conditioning, and ventilation equipment for more comfortable living. Engineers also develop scientific equipment to probe outer space and the ocean depths; design defense and weapons systems for the Armed Forces; and design, plan, and supervise the construction of buildings, highways, and rapid transit systems. They also design and develop consumer products such as automobiles, home appliances, electronic home entertainment equipment, and systems for control and automation of manufacturing, business, and management processes.

Engineers must consider many factors in developing a new product. For example, in developing an industrial robot, engineers must determine the general way it will work, design, and test all components, and fit them together in an integrated plan. They must then evaluate its overall effectiveness, cost, reliability, and safety. This process applies to products as different as lawnmowers, computers, military weapons, and toys.

In addition to design and development, many engineers work in testing, production, operations, or maintenance. They supervise production processes in factories, determine the causes of breakdowns, and test newly manufactured products to maintain quality. They also estimate the time and cost to complete projects. Some work in engineering administration and management, or in sales where an engineering background enables them to discuss the technical aspects of a product and assist in planning its installation or use. (See the statement on manufacturers' sales workers elsewhere in the *Handbook*.) Some engineers work as consultants.

Most engineers specialize; more than 25 major specialties are recognized by professional societies. Within the major branches are numerous subdivisions. Structural, hydraulic, and highway engineering, for example, are subdivisions of civil engineering. Engineers also may specialize in one industry, such as motor vehicles, or in one field of technology, such as propulsion or guidance systems.

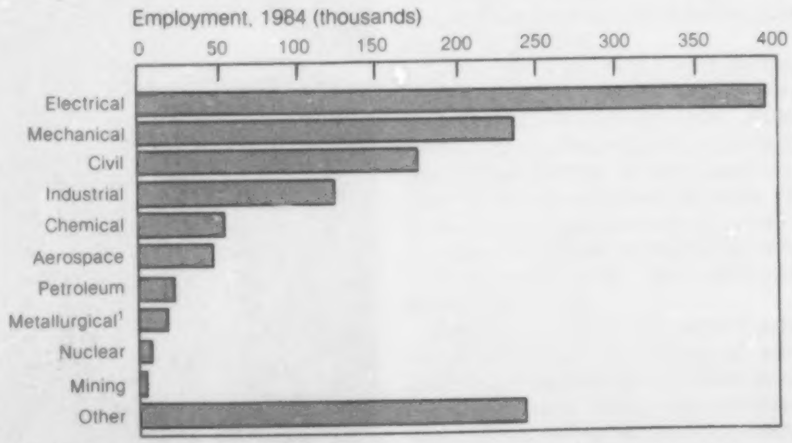
Engineers in each branch apply their knowledge to many fields. Electrical engineers, for example, work in the medical, computer, missile guidance, or power distribution fields. Because complex problems cut across traditional fields, engineers in one field often work closely with specialists in scientific, other engineering, and business occupations.

Often using calculators and computers to solve mathematical equations which describe how a machine, structure, or system operates, many engineers also use computer-aided design systems to produce and analyze designs. They also spend a great deal of time writing reports and consulting with other engineers. Complex projects require many engineers, each working with a small part of the job. Supervisory engineers are responsible for entire projects.

Working Conditions

Some engineers are at a desk in an office building almost all of the time but others work in research laboratories, industrial plants, or construction sites where they inspect, supervise, or solve onsite problems. Engineers in specialties such as civil engineering may work outdoors part of the time. A

Electrical engineering is the largest engineering specialty.



[1] Includes ceramic and materials engineering.

SOURCE: Bureau of Labor Statistics

few engineers travel extensively to plants or construction sites.

Employment

Engineering is the second largest profession, exceeded only by teaching. In 1984, engineers held over 1.3 million jobs. Over one-half of all engineering jobs were located in manufacturing industries—mostly in electrical and electronic equipment, machinery, aircraft and parts, scientific instruments, chemicals, motor vehicles, fabricated metal products, and primary metals industries. In 1984, 445,000 jobs were in nonmanufacturing industries, primarily in engineering and architectural services, business and management consulting services, communications and utilities, and construction.

Federal, State, and local governments employed about 160,000 engineers. Over half of the jobs were in the Federal Government, mainly in the Departments of Defense, Transportation, Agriculture, Interior, and Energy, and in the National Aeronautics and Space Administration. Most engineers in State and local government agencies worked in highway and public works departments.

Besides the jobs described above, about 40,000 persons held engineering faculty positions in colleges and universities in 1984. (See the statement on college and university faculty elsewhere in the *Handbook*.)

Engineers are employed in every State, in small and large cities, and in rural areas. Some branches of engineering are concentrated in particular industries and geographic areas, as discussed in statements later in this chapter.

Training, Other Qualifications, and Advancement

A bachelor's degree in engineering is generally acceptable for beginning engineering jobs. College graduates with a degree in science or mathematics and experienced technicians may also qualify for some jobs.

Many 2- or 4-year college programs in engineering technology prepare students for practical design and production work rather than for jobs that require more theoretical scientific and mathematical knowledge. Graduates of such 4-year technology programs may get jobs similar to those obtained by graduates with a bachelor's degree in engineering. However, some employers regard them as having skills between those of a technician and an engineer.

Graduate training is essential for engineering faculty positions but is not needed for the majority of entry level engineering jobs. Many engineers obtain a master's degree however, because it often is desirable for learning new technology or for promotion.

About 260 colleges and universities offer a bachelor's degree in engineering, and over 90 colleges offer a bachelor's degree in engineering technology. Although most institutions offer programs in the larger branches of engineering, only a few offer some of the smaller specialties. Also, course offerings of the same title may vary. For example, one chemical engineering program could emphasize industrial practices, preparing the student for a job in industry, while another could be more theoretical, a better choice for the student preparing to take graduate work. Therefore, students should investigate curriculums carefully before selecting a college. Admissions requirements for undergraduate engineering schools usually include courses in advanced high school mathematics and the physical sciences.

In a typical 4-year curriculum, the first 2 years are spent studying basic sciences—mathematics, physics, chemistry—and introductory engineering and the humanities, social sciences, and English. In the last 2 years, most courses are in engineering, usually with a concentration in one branch of engineering. Some programs offer a general engineering curriculum; students then specialize in graduate school or on the job.

Some engineering schools and 2-year colleges have entered into agreements whereby the 2-year college provides the initial engineering education and the engineering school automatically admits students for their

Table 1. Degrees granted by engineering specialty, academic year 1982–83

Specialty	Bachelor's	Master's	Doctor's
Total	88,994	19,327	2,827
Aerospace, aeronautical, and astronautical engineering	2,127	491	90
Agricultural engineering	776	131	40
Architectural engineering	465	28	—
Bioengineering and biomedical engineering	529	228	43
Ceramic engineering	311	74	22
Chemical engineering	7,185	1,368	319
Civil engineering	9,989	3,074	340
Computer engineering	1,015	287	23
Electrical, electronics, and communications engineering	18,049	4,531	550
Engineering and related technologies	16,951	520	9
Engineering, general	3,357	1,311	284
Engineering mechanics	302	172	55
Engineering physics	291	77	14
Engineering science	216	81	22
Environmental health engineering	228	394	35
Geological engineering	347	54	6
Geophysical engineering	93	10	2
Industrial engineering	3,748	1,432	118
Materials engineering	434	301	146
Mechanical engineering	15,675	2,511	299
Metallurgical engineering	645	253	79
Mining and mineral engineering	597	131	22
Naval architecture and marine engineering	629	62	2
Nuclear engineering	391	292	109
Ocean engineering	181	85	15
Petroleum engineering	1,294	174	14
Systems engineering	270	149	24
Textile engineering	41	—	—
Other	2,858	1,106	145

SOURCE: National Center for Education Statistics.

last 2 years. In addition, some engineering schools have arrangements whereby a student spends 3 years in a liberal arts college studying pre-engineering subjects and 2 years in the engineering school and receives a bachelor's degree from each. Some colleges and universities offer 5-year master's degree programs.

Some 5- or even 6-year cooperative plans combine classroom study and practical work experience. In this way, in addition to gaining useful experience, students can finance part of their education. To keep up with rapid advances in technology, most engineers must continue their education throughout their careers.

All 50 States and the District of Columbia require licensing for engineers whose work may affect life, health, or property, or who offer their services to the public. In 1984, almost 500,000 engineers were registered. Registration generally requires a degree from an accredited engineering program, 4 years of relevant work experience, and passing a State examination. Some States will not register those with degrees in engineering technology.

Beginning engineering graduates usually do routine work under the close supervision of experienced engineers and, in larger companies, may also receive formal classroom or seminar-type training. As they gain knowledge and experience, they are assigned more difficult tasks with greater independence to develop designs, solve problems, and make decisions. Engineers may become technical specialists or may supervise a staff or team of engineers and technicians. Some eventually become managers or administrators within engineering; others leave engineering for nontechnical managerial, administrative, or sales jobs. Some engineers obtain graduate degrees in business administration to improve advancement opportunities; others obtain law degrees and become patent attorneys. Many high level executives in government and industry began their careers as engineers.

Engineers should be able to work as part of a team and should have creativity, an analytical mind, and a capacity for detail. In addition, engineers should be able to express themselves well—both orally and in writing.

Job Outlook

Employment opportunities for those with degrees in engineering are expected to be good through the mid-1990's. In addition, there may be some opportunities for college graduates from related fields in certain engineering jobs.

Employment of engineers is expected to increase much faster than the average for all occupations through the mid-1990's. Although only a relatively small proportion of engineers leave the profession each year, most job openings will arise from replacement needs. Most replacement openings are created by engineers who transfer to management, sales, or other professional occupations rather than by engineers who leave the labor force.

Much of the projected growth in requirements for engineers will stem from the expected higher levels of investment in industrial plant and equipment to meet the demand for more goods and services and to increase productivity. More engineers also will be needed to develop and manufacture defense-related products and to improve transportation facilities. Competitive pressures and advancing technology will force companies to improve and update product designs more rapidly than in the past, further adding to requirements.

Most industries are less likely to lay off engineers than other workers. Many engineers work on long-term research and development projects or in other activities which often continue even during recessions. However, in industries such as electronics and aerospace, large cutbacks in defense or research and development expenditures may result in layoffs for engineers.

New computer-aided design systems enable an engineer to produce or modify a design much more rapidly than previously. This increased productivity might result in decreased employment opportunities for engineers doing more routine tasks. However, most of these systems have been used to improve the design process by allowing many more design variations to be produced and analyzed. Therefore this technology is not expected to affect employment growth significantly.

It is important for engineers to continue their education throughout their careers because their value to their employer depends on their knowledge of the latest technology. The pace of technological change varies by engineering specialty and industry. Engineers in high-technology areas such as advanced electronics or aerospace may find that their knowledge becomes obsolete rapidly. Even engineers who continue their education are vulnerable to obsolescence if the particular technology or product they have specialized in becomes obsolete. Engineers whom employers consider not to have kept up may find themselves passed over for promotions and are particularly vulnerable to layoffs. However, it is often these high-technology areas that offer the greatest challenges, the most interesting work, and the highest salaries. Therefore, the choice of engineering specialty and employer involves an assessment not only of the potential rewards but also of the risk of technological obsolescence later in one's career.

Despite these problems, over the long run the number of people seeking jobs as engineers is expected to about equal the number of job openings. (The outlook for various branches is discussed in the separate statements that follow this introductory section.)

Earnings

According to the College Placement Council, engineering graduates with a bachelor's degree and no experience averaged about $26,300 a year in private industry in 1984; those with a master's degree and no experience, $30,400 a year; and those with a Ph.D., $39,500. Starting offers for those with the bachelor's degree vary by branch, as shown in the following tabulation.

Petroleum engineering	$29,568
Chemical engineering	27,420
Electrical engineering........	26,556
Metallurgical engineering.....	26,556
Nuclear engineering	26,388
Mechanical engineering	26,280
Aeronautical engineering.....	25,836
Industrial engineering........	25,224
Mining engineering	24,876
Civil engineering	27,764

Engineers in private industry in 1985 averaged $27,405 at the most junior level, and $76,205 at senior managerial levels. Experienced mid-level engineers with no supervisory responsibilities averaged $40,991. (See table 2.)

In the Federal Government in 1985, most engineers with a bachelor's de-

Table 2. Engineers' salaries in private industry by work level, 1985

Level	Percent of all engineers	Average salary
Engineers I	5.6	$27,405
Engineers II	10.7	30,275
Engineers III......	24.5	34,348
Engineers IV......	26.9	40,991
Engineers V	19.4	48,366
Engineers VI......	9.9	56,136
Engineers VII.....	2.5	65,641
Engineers VIII	.5	76,205

SOURCE: Bureau of Labor Statistics.

gree and no experience could start at $18,710 or $23,170 a year, depending on their college records. Those with a master's degree could start at $25,980, and those having a Ph.D. degree could begin at $28,039. The average salary for engineers in the Federal Government was about $38,000 in 1984.

Related Occupations

Engineers apply the principles of physical science and mathematics in their work. Other occupations which also use scientific and mathematical principles are physical scientists, life scientists, mathematicians, engineering and science technicians, and architects.

Sources of Additional Information

General information on engineering careers—including engineering school requirements, courses of study, and salaries—is available from:

JETS, Inc., 345 E. 47th St., New York, N.Y. 10017.

Society of Women Engineers, 345 E. 47th St., New York, 10017.

National Society of Professional Engineers, 1420 King St., Alexandria, Va. 22314.

A list of accredited engineering programs may be obtained from:

The Accreditation Board for Engineering and Technology, 345 E. 47th St., New York, N.Y. 10017.

Societies representing many of the individual branches of engineering are listed in this chapter. Each can provide information about careers in the particular branch.

Aerospace Engineers

(D.O.T. 002.061 and .167)

Nature of the Work

Aerospace engineers design, develop, test, and help produce commercial and military aircraft, missiles, and spacecraft. They develop new technologies in commercial aviation, defense systems, and space exploration, often specializing in areas like structural design, navigational guidance and control, instrumentation and communication, or production methods. They also may specialize in one type of aerospace product, such as passenger planes, helicopters, satellites, or rockets.

Employment

Aerospace engineers held 48,000 jobs in 1984. Over 6 out of 10 jobs were located in the aircraft and parts and guided missile and space vehicle industries. Federal Government agencies, primarily the Department of Defense and the National Aeronautics and Space Administration, provided almost 2 out of 10 jobs. Business and engineering consulting firms, communications equipment manufacturing firms, and commercial airlines accounted for most of the remainder.

California, Washington, and Texas, States with large aerospace manufacturers, have the most aerospace engineers.

Job Outlook

Employment of aerospace engineers is expected to grow faster than the average for all occupations through the mid-1990's as Federal outlays increase for new military aircraft, missiles, and other aerospace systems. Aerospace engineers also will be needed to design and help produce new commercial aircraft. Much of the present fleet of airliners will have to be replaced with quieter and more fuel-efficient aircraft. Increased demand for spacecraft, helicopters, and business aircraft also will create opportunities for aerospace engineers. However, the increasing sophistication of aerospace products may mean that many engineering jobs will be filled by other engineering specialists such as chemical, mechanical, or electrical engineers. Despite the expected faster than average growth in employment, most job openings will result from the need to replace aerospace engineers who transfer to other occupations or leave the labor force.

Since a large proportion of aerospace engineering jobs are defense related, cutbacks in defense spending can result in layoffs of aerospace engineers.

Many aerospace engineers work in aircraft, guided missile, and space vehicle manufacturing industries.

Sources of Additional Information

American Institute of Aeronautics and Astronautics, Inc., 1633 Broadway, New York, N.Y. 10019.

(See introductory section of this chapter for discussion of training requirements and earnings.)

Chemical Engineers

(D.O.T. 008.061 and .167)

Nature of the Work

Chemical engineers work in many phases of the production of chemicals and chemical products. They design equipment and plants and determine and test methods of manufacturing the products. Chemical engineers also work in areas other than chemical manufacturing such as electronics manufacturing or biotechnology. Because the duties of chemical engineers cut across many fields, they apply principles of chemistry, physics, mathematics, and mechanical and electrical engineering. They frequently specialize in a particular operation such as oxidation or polymerization. Others specialize in a particular area such as pollution control or the production of a specific product like plastics or rubber.

Employment

Chemical engineers held 56,000 jobs in 1984. Two-thirds were in manufac-

Chemical engineers discuss chemical production process.

turing industries, primarily in the chemical, petroleum refining, and related industries. Almost one-fifth worked for engineering service or consulting firms, and a small number worked for government agencies or as independent consultants.

Job Outlook

Employment of chemical engineers is expected to grow faster than the average for all occupations through the mid-1990's. Most openings, however, will result from the need to replace chemical engineers who transfer to other occupations or leave the labor force.

A major factor underlying projected employment growth is expansion in the energy and chemical industries. The growing complexity and automation of chemical processes will require additional chemical engineers to design, build, and maintain the necessary plants and equipment. Development of new chemicals used in the manufacture of consumer goods, such as plastics and synthetic fibers, will create additional openings. Also, the field of biotechnology may create opportunities for chemical engineers.

Sources of Additional Information

American Institute of Chemical Engineers, 345 East 47th St., New York, N.Y. 10017.

American Chemical Society, Career Services, 1155 16th St. NW., Washington,D.C. 20036.

(See introductory part of this section for information on training requirements and earnings.)

Civil Engineers

(D.O.T. 005.061, .167 except -022; and 019.167-018)

Nature of the Work

Civil engineers, who work in the oldest branch of engineering, design and supervise the construction of roads, airports, tunnels, bridges, water supply and sewage systems, and buildings. Major specialties within civil engineering are structural, hydraulic, environmental (sanitary), transportation, highway, and soil mechanics.

Many supervisory or administrative positions, ranging from supervisor of a construction site to city engineer, are held by civil engineers. Others work as independent consultants.

Employment

Civil engineers held 175,000 jobs in 1984. Over 40 percent of the jobs were in Federal, State, and local government agencies. Almost a third of the jobs were in firms that provide engineering, design, and architectural consulting services. The construction industry, public utilities, railroads, and manufacturing industries accounted for most of the rest.

Working in all parts of the country, civil engineers usually are found in or near major industrial and commercial centers, often working at construction sites, but sometimes in remote areas or in foreign countries. In some jobs, they often move from place to place to work on different projects.

Job Outlook

Employment of civil engineers is expected to increase faster than the average for all occupations through the mid-1990's. Most job openings, however, will result from the need to replace civil engineers who transfer to other occupations or leave the labor force.

Civil engineers review project plans.

A growing population and an expanding economy will result in a need for more civil engineers to design and construct transportation systems, manufacturing plants, office buildings, and other structures. More civil engineers also will be needed to repair or replace existing roads, bridges, and other public structures.

Construction and related industries, including those providing design services, employ many civil engineers. Employment opportunities here may decrease during economic slowdowns, when many construction projects often are curtailed.

Sources of Additional Information

American Society of Civil Engineers, 345 E. 47th St., New York, N.Y. 10017.

(See introductory part of this section for information on training requirements and earnings.)

Electrical and Electronics Engineers

(D.O.T. 003.061, .167, and .187)

Nature of the Work

Electrical and electronics engineers design, develop, test, and supervise the manufacture of electrical and electronic equipment. Electrical equipment includes power generating and transmission equipment used by electric utilities and electric motors, machinery controls, and lighting and wiring in buildings, automobiles, and aircraft. Electronic equipment includes radar, computers, communications equipment, and consumer goods such as TV sets and stereo components.

The specialties of electrical and electronics engineers include several major areas—such as power distributing equipment, integrated circuits, computers, electrical equipment manufacturing, or communications—or a subdivision of these areas—industrial robot control systems or aviation electronics, for example. Electrical and electronics engineers design new products, write performance requirements, and develop maintenance schedules. They also test equipment, solve operating problems, and estimate the time and cost of engineering projects. Besides manufacturing and research, development, and design, many are employed in administration and management or technical sales.

Electrical and electronics engineering is the largest branch of engineering.

Employment

Electrical and electronics engineers held over 390,000 jobs in 1984, making it the largest branch of engineering. Most jobs were in firms that manufacture electrical and electronic equipment, business machines, professional and scientific equipment, and aircraft and parts. Engineering and business consulting firms, public utilities, and government agencies accounted for most of the remaining jobs. Some electrical and electronics engineers worked as independent consultants.

Job Outlook

Employment opportunities for electrical and electronics engineers are expected to be excellent through the mid-1990's because employment is expected to increase much faster than the average for all occupations and shortages of electrical engineering faculty and laboratory equipment may act to restrict enrollments in electrical engineering programs. Despite rapid growth, however, the majority of job openings will result from the need to replace electrical and electronics engineers who transfer to other occupations or leave the labor force.

Although increased demand by businesses and government for computers, communications equipment, and military electronics is expected to account for much of the projected employment growth, consumer demand for electrical and electronic goods and increased research and development on robots and other types of automation should create additional jobs.

Since many electrical and electronics engineering jobs are defense related, cutbacks in defense spending could result in layoffs. Furthermore, those who fail to keep up with the rapid changes in technology in some electrical engineering specialties risk technological obsolescence, which makes them more susceptible to layoffs or, at a minimum, likely to be passed over for advancement.

Sources of Additional Information

Institute of Electrical and Electronics Engineers/United States Activities Board, 1111 19th St. NW., Suite 608, Washington, D.C. 20036.

(See introductory part of this section for information on training requirements and earnings.)

Industrial Engineers

(D.O.T. 012.061-018, .067, .167 except -022, -026, -034, -058, and -066, and .187)

Nature of the Work

Industrial engineers determine the most effective ways for an organization to use the basic factors of production—people, machines, materials, and energy. They are more concerned with people and methods of business organization than are engineers in other specialties, who generally work more with products or processes.

Industrial engineers are more concerned with people and methods of business organization than are other engineers.

To solve organizational, production, and related problems most efficiently, industrial engineers design data processing systems and apply mathematical analysis such as operations research. They also develop management control systems to aid in financial planning and cost analysis, design production planning and control systems to coordinate activities and control product quality, and design or improve systems for the physical distribution of goods and services. Industrial engineers conduct surveys to find plant locations with the best combination of raw materials, transportation, and taxes. They also develop wage and salary administration systems and job evaluation programs. Many industrial engineers move into management positions because the work is closely related.

Employment

Industrial engineers held about 125,000 jobs in 1984; over 3 out of 4 jobs were in manufacturing industries. Because their skills can be used in almost any type of organization, industrial engineers are more widely distributed among industries than other engineers. For example, some even work for insurance companies, banks, hospitals, and retail organizations. Some work for government agencies or are independent consultants.

Job Outlook

Employment opportunities for industrial engineers are expected to be good; their employment is expected to grow faster than the average for all occupations through the mid-1990's. Most job openings, however, will result from the need to replace industrial engineers who transfer to other occupations or leave the labor force.

Industrial growth, more complex business operations, and the greater use of automation both in factories and in offices underlie the projected employment growth. Jobs also will be created as firms seek to reduce costs and increase productivity through scientific management and safety engineering.

Sources of Additional Information

Institute of Industrial Engineers, Inc., 25 Technology Park/Atlanta, Norcross, Ga. 30092.

(See introductory part of this section for information on training requirements and earnings.)

Mechanical Engineers

(D.O.T. 007.061, .161-022, -034, and -038, .167-014, and .267)

Nature of the Work

Mechanical engineers are concerned with the use, production, and transmission of mechanical power and heat. They design and develop power-producing machines such as internal combustion engines, steam and gas turbines, and jet and rocket engines. They also design and develop power-using machines such as refrigeration and air-conditioning equipment, robots, machine tools, materials handling systems, and industrial production equipment.

The work of mechanical engineers varies by industry and function. Many specialties have developed within the field; they include motor vehicles; energy conversion systems; heating, ventilating, and air-conditioning; instrumentation; and special machines for industries such as petroleum, rubber, plastics, and construction.

Large numbers of mechanical engineers do research, test, and design work while others work in maintenance, technical sales, and production operations. Many are administrators or managers. Some work as consultants.

Employment

Mechanical engineers held almost 237,000 jobs in 1984. Over 3 out of 5 jobs were in manufacturing—most in the machinery, transportation equipment, electrical equipment, and fabricated metal products industries. Business and engineering consulting services and government agencies provided most of the remaining jobs.

Job Outlook

Employment opportunities for mechanical engineers are expected to be good. Their employment is expected to increase much faster than the average for all occupations through the mid-1990's as the demand for machinery and machine tools grows and industrial machinery and processes become increasingly complex. Mechanical engineers also will be needed to

A mechanical engineer designs industrial equipment.

develop new energy and defense systems. Despite this expected employment growth, however, most job openings will result from the need to replace mechanical engineers who transfer to other occupations or leave the labor force.

Sources of Additional Information

The American Society of Mechanical Engineers, 345 E. 47th St., New York, N.Y. 10017.

(See introductory part of this section for information on training requirements and earnings.)

Metallurgical, Ceramic, and Materials Engineers

(D.O.T. 006.061; 011.061, .161, and .261-018; and 019.061-014)

Nature of the Work

Metallurgical, ceramic, and materials engineers develop new types of metals and other materials tailored to meet specific requirements—for example, materials that are heat resistant, strong but lightweight, or highly malleable.

Most metallurgical engineers work in one of the three main branches of metallurgy—extractive or chemical, physical, and mechanical or process. Extractive metallurgists are concerned with removing metals from ores, and refining and alloying them to obtain useful metal. Physical metallurgists deal with the nature, structure, and physical properties of metals and their alloys, and with methods of converting refined metals into final products. Mechanical metallurgists are concerned with processes such as casting, forging, rolling, and drawing metals to work and shape them.

Ceramic engineers develop new ceramic materials and methods for making ceramic materials into useful products. Ceramics include all nonmetallic, inorganic materials which require the use of high temperature in their processing. Ceramic engineers work on products as diverse as glassware, electronic components, automobile and aircraft engine components, brick, and tile.

Materials engineers evaluate technical and economic factors to determine which of the many metals, plastics, ceramics, or other materials available is best for each application. Materials engineers also test and evaluate materials and develop new ones.

Employment

Metallurgical, ceramic, and materials engineers held about 19,000 jobs in 1984. One-fourth worked in metal-producing industries. They also worked in industries that manufacture aircraft and parts, machinery, and electrical equipment, and in business and engineering consulting firms and government agencies.

Job Outlook

Employment of metallurgical, ceramic, and materials engineers is expected to grow faster than the average for all occupations through the mid-1990's. Most job openings, however, will result from the need to replace engineers who transfer to other occupations or leave the labor force.

More metallurgical, ceramic, and materials engineers will be needed by the metalworking and other industries to develop new metals and alloys as well as to adapt current ones to new applications. For example, jet engines require metals that can withstand extreme heat. As the supply of high-grade ores diminishes, more metallurgical engineers will be required to develop new ways of recycling solid waste materials and processing low-grade ores now regarded as unprofitable to mine.

More ceramic and materials engineers will be needed to develop improved materials and products, for example, ceramic automobile engines which are more fuel efficient than metal engines.

Sources of Additional Information

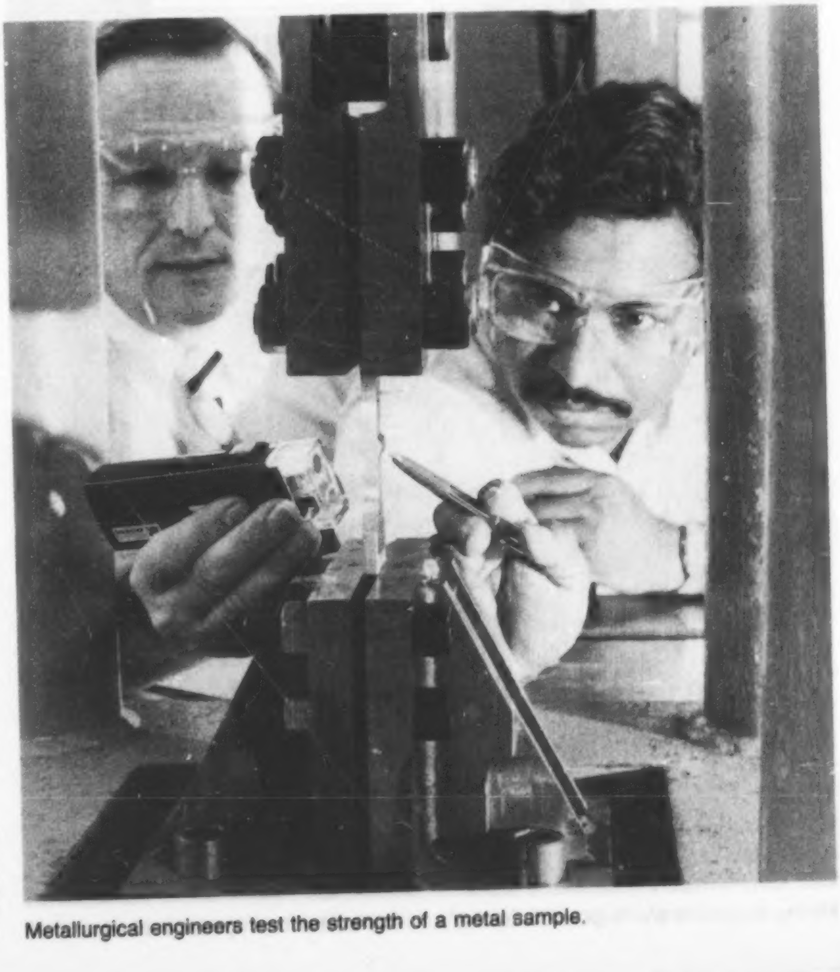
The Metallurgical Society of AIME, 420 Commonwealth Dr., Warrendale, Pa. 15086.

American Society for Metals, Metals Park, Ohio 44073.

American Ceramic Society, 65 Ceramic Drive, Columbus, Ohio 43214.

National Institute of Ceramic Engineers, 65 Ceramic Drive, Columbus, Ohio 43214.

(See introductory part of this section for information on training requirements and earnings.)



Metallurgical engineers test the strength of a metal sample.

Mining Engineers

(D.O.T. 010.061 except -018)

Nature of the Work

Mining engineers find, extract, and prepare minerals for manufacturing industries to use. They design open pit and underground mines, supervise the construction of mine shafts and tunnels in underground operations, and devise methods for transporting minerals to processing plants. Mining engineers are responsible for the safe and economical operation of mines, including ventilation, water supply, power, communications, and equipment maintenance. Some mining engineers work with geologists and metallurgical engineers to locate and appraise new ore deposits. Others develop new mining equipment or direct mineral processing operations to separate minerals from the dirt, rock, and other materials they are mixed with. Mining engineers frequently specialize in the mining of one mineral, such as coal or copper.

With increased emphasis on protecting the environment, many mining engineers have been working to solve problems related to land reclamation and water and air pollution.

Employment

Mining engineers held about 7,200 jobs in 1984. The mining industry provided over 3 out of 5 jobs. Other jobs were located in government agencies, engineering consulting firms, or in manufacturing industries.

Mining engineers are usually employed at the location of mineral deposits, often near small communities. However, those in research, management, consulting, or sales often are located in metropolitan areas.

Mining engineers are responsible for the safe and economical operation of mines.

Job Outlook

Employment of mining engineers is expected to increase more slowly than the average for all occupations through the mid-1990's due to expected low growth in demand for coal and other minerals. Most job openings will result from the need to replace the large proportion of mining engineers who transfer to other occupations each year.

The increase in demand for coal and engineers employed in coal mining will depend, to a great extent, on the availability and price of other energy sources such as petroleum, natural gas, and nuclear energy as well as the price of coal in other countries. However, more technologically advanced mining systems and further enforcement of mine health and safety regulations may increase the need for mining engineers. As easily mined deposits are depleted, engineers must devise more efficient methods for mining low-grade ores. Employment opportunities also will arise as new alloys and new uses for metals increase the demand for less widely used ores.

Sources of Additional Information

The Society of Mining Engineers of AIME, Caller Number D, Littleton, Colo. 80127.

(See introductory part of this section for information on training requirements and earnings.)

Nuclear Engineers

(D.O.T. 008.061-030; 015.061, .067, .137, and .167)

Nature of the Work

Nuclear engineers design, develop, monitor, and operate nuclear power plants used to generate electricity and power Navy ships. They also conduct research on nuclear energy and radiation. For example, they may work on the nuclear fuel cycle—the production, handling, and use of nuclear fuel and the safe disposal of waste produced by nuclear energy—or on breeder reactors or fusion energy. Some specialize in the development of nuclear weapons; others develop industrial and medical uses for radioactive materials.

Employment

Nuclear engineers held almost 9,700 jobs in 1984; over one-quarter were in the Federal Government. Nearly half of all federally employed nuclear en-

Nuclear engineer examines a model of nuclear powerplant.

gineers were civilian employees of the Navy, about one-third worked for the Nuclear Regulatory Commission, and most of the rest worked for the Department of Energy or the Tennessee Valley Authority. Most nonfederally employed nuclear engineers worked for public utilities or engineering consulting companies. Some worked for manufacturers of nuclear power equipment.

Job Outlook

Employment of nuclear engineers is expected to grow more slowly than the average for all occupations through the mid-1990's. Most job openings will result from the need to replace nuclear engineers who retire or leave the occupation.

Because of a combination of reduction in the growth of demand for electric power due to energy conservation and concerns over the safety of nuclear power, few nuclear power plants are likely to be started before the mid-1990's. However, more nuclear engineers will be needed to operate plants presently under construction. In addition, more nuclear engineers may be needed to improve and enforce safety standards and to work in defense-related areas.

Sources of Additional Information

American Nuclear Society, 555 North Kensington Ave., LaGrange Park, Ill. 60525.

Atomic Industrial Forum, Inc., Public Affairs and Information Program, 7101 Wisconsin Ave., Washington, D.C. 20014.

(See introductory part of this section for information on training requirements and earnings.)

Petroleum Engineers

(D.O.T. 010.061 except -014 and -026, .161-010 and -014, and .167)

Nature of the Work

Most petroleum engineers explore and drill for oil and gas. They work to achieve the maximum profitable recovery of oil and gas from a petroleum reservoir by determining and developing the most efficient production methods.

Since only a small proportion of the oil and gas in a reservoir will flow out under natural forces, petroleum engineers develop and use various enhanced recovery methods, such as flooding the oil field with water to force the oil to the surface. The best methods in use today recover only about half the oil. Petroleum engineers' research and development in the future will be directed at finding ways to increase the proportion of oil recovered in each reservoir.

Petroleum engineers also supervise drilling operations, conduct research on drilling methods, and develop new methods to recover offshore oil and gas. As oil and gas become harder to find, petroleum engineers must develop methods of recovery in areas that were previously considered inaccessible.

Employment

Petroleum engineers held over 22,000 jobs in 1984, mostly in the petroleum industry and closely allied fields. Employers include major oil companies and hundreds of smaller, independent oil exploration, production, and service companies. Engineering consulting firms, government agencies, and equipment suppliers also employ pe-

Petroleum engineers work mostly in areas where oil and gas are found.

troleum engineers. Others work as independent consultants.

Most petroleum engineers work in places where oil and gas are found. Large numbers are employed in Texas, Oklahoma, Louisiana, and California. Also, many American petroleum engineers work overseas in oil-producing countries.

Job Outlook

Employment of petroleum engineers is expected to grow about as fast as the average for all occupations through the mid-1990's, as economic expansion requires increasing supplies of petroleum and natural gas. With oil and gas becoming harder to find, more sophisticated and expensive recovery methods will be used to develop new sources of oil, such as offshore and in the Arctic. Despite this expected employment growth, most job openings will result from the need to replace petroleum engineers who transfer to other occupations or leave the labor force.

Sources of Additional Information

Society of Petroleum Engineers, P.O. Box 833836, Richardson, Tex. 75083-3836.

(See introductory part of this section for information on training requirements and earnings.)

Natural Scientists and Mathematicians

Nature of the Work

Natural and mathematical scientists seek knowledge of the physical world through observation, study, and experimentation. The knowledge gained through these research activities has been used to develop new products, increase productivity, provide greater defense capabilities, protect the environment, and improve health care. Three subgroups make up this broad occupational field: Physical scientists, life scientists, and computer and mathematical occupations.

Physical scientists study the nature of matter and energy both on earth and in the rest of the universe (physicists and chemists), how physical processes affect the earth (geologists and geophysicists), and its atmosphere (meteorologists).

Life scientists study living organisms and their life processes. Biological scientists study all forms of life and life processes. Most biological scientists specialize in certain areas of biology. For example, entomologists study insects; physiologists study the life processes of plants or animals. Agricultural scientists apply principles of life science to problems in agriculture such as improving crop yield or breeding better animals. Foresters and conservation scientists apply principles of life science to conserving and increasing the productivity of forests, rangelands, and soil.

Those in computer and mathematical occupations study mathematics and use it as a tool to solve practical and theoretical problems in business, science, and engineering. Mathematicians, actuaries, statisticians, and systems analysts apply mathematical techniques to problems in business, health care, defense, and other areas.

Training, Other Qualifications, and Advancement

For some natural science and mathematics jobs, a bachelor's degree is adequate for entry. However, in fields such as mathematics, physics, biology, or agricultural science, an advanced degree is usually required for entry into professional level jobs.

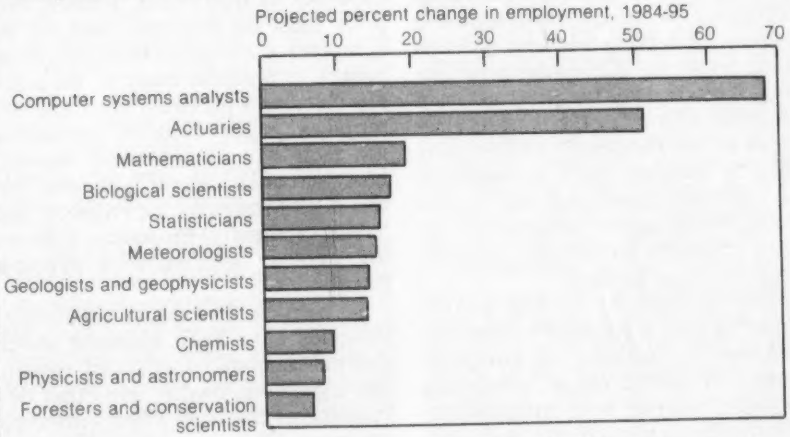
Undergraduate training for natural scientists and mathematicians includes courses in their major field and in related scientific fields.

In graduate school, students take more advanced courses in their major area of study and in related sciences. Requirements for the master's or doctor's degree usually include a thesis, which is a report on the student's original research.

Job Outlook

In the past, growth in employment of natural scientists and mathematicians has been related to an expanding economy and to increased research and development (R&D) expenditures. Both government and industry are expected to increase their R&D expenditures through the mid-1990's in order to expand basic knowledge of natural science, develop new technologies and products, and protect the environment. However, if the rate of economic growth and actual R&D levels and patterns differ from those assumed, the job outlook in many occupations described in this section would be altered.

Among natural scientists and mathematicians, computer systems analysts and actuaries are expected to have the most rapid growth.



SOURCE: Bureau of Labor Statistics

Computer and Mathematical Occupations

Mathematics and statistics are sciences which, through the use of quantitative techniques, facilitate our understanding and expression of ideas in many kinds of work. Although mathematics, statistics, and computers are used extensively in many occupations, people in the occupations covered in this section of the *Handbook* use quantitative techniques to a much greater degree than others, and often devise new techniques to solve problems. Many persons with strong mathematical backgrounds teach mathematics or do research in theory and in applied mathematical problems. Statisticians design and interpret surveys and experiments and test theories dealing with people or things. Actuaries use statistical and mathematical techniques to assess the likelihood of risks that insurance companies agree to cover and to calculate the costs associated with insuring such risks. Computer systems analysts use mathematical, statistical, and accounting techniques to design programmable systems for solving business and scientific problems. (Computer programmers, who develop the programs, are discussed with other technicians elsewhere in the *Handbook*.) Operations research analysts study management and operational problems and formulate mathematical or simulation models of problems for solution by computers or other methods.

Most occupations in this section require at least a bachelor's degree in mathematics, statistics, or computer science. A double major, combining computer science with mathematics or statistics, is particularly desirable. A graduate degree, preferably a doctorate, is necessary for college teaching and research positions and for advancement in many nonacademic jobs.

Actuaries

(D.O.T. 020.167-010)

Nature of the Work

Why do young persons pay more for automobile insurance than older persons? How much should an insurance policy cost? How much should an organization contribute each year to its pension fund? Answers to these and similar questions are provided by actuaries who design insurance and pension plans and keep informed on their operation to make sure that they are maintained on a sound financial basis. Actuaries assemble and analyze statistics to calculate probabilities of death, sickness, injury, disability, unemployment, retirement, and property loss from accident, theft, fire, and other hazards. They use this information to determine the expected insured loss. For example, they may calculate how many persons who are 21 years old today can be expected to die before age 65—the probability that an insured person might die during this period is a risk to the company. They must make sure that the price charged for the insurance will enable the company to pay all claims and expenses as they occur. Finally, this price must be profitable and yet be competitive with other insurance companies. In a similar manner, the actuary calculates premium rates and determines policy contract provisions for each type of insurance offered. Most actuaries specialize in either life and health insurance or property and liability (casualty) insurance; a growing number specialize in pension plans.

To perform their duties effectively, actuaries must keep informed about general economic and social trends, and legislative, health, and other developments that may affect insurance practices. Because of their broad knowledge of insurance, company actuaries may work in investment, group underwriting, or pension planning departments. Actuaries in executive positions help determine company policy. In that role, they may be called upon to explain complex technical matters to company executives, government officials, policyholders, and the public. They may testify before public agencies on proposed legislation affecting the insurance business, for example, or explain intended changes in premium rates or contract provisions. They also may help companies develop plans to enter new lines of business.

The small number of actuaries who work for the Federal Government usually deal with a particular insurance or pension program, such as Social Security or life insurance for veterans and members of the Armed Forces. Actuaries in State government regulate insurance companies, supervise the operations of State retirement or pension systems, work on unemployment insurance or workers' compensation problems, and advise on the impact of proposed legislation. Consulting actuaries set up pension and welfare plans for private companies, unions, and government agencies. They calculate future benefits and determine the amount of employer contributions. Actuaries who are enrolled under the provisions of the Employee Retirement Income Security Act of 1974 (ERISA) evaluate these pension plans and report on their financial soundness.

Working Conditions

Actuaries have desk jobs that require no unusual physical activity; their offices generally are comfortable and pleasant. They generally work between 35 and 40 hours a week except during busy periods, when overtime may be required, and they may be required to travel to branch offices of their company or to clients.

Employment

Actuaries held about 7,700 jobs in 1984. Many worked in insurance company headquarters in New York, Hartford, Chicago, Philadelphia, or Boston.

Most of these worked for life insurance companies; others worked for property and liability (casualty) companies. The number of actuaries employed by an insurance company depends on its volume of business and the types of insurance policies it offers. Large companies may employ over 100 actuaries; others, generally smaller companies, may rely instead on consulting firms, accounting firms, or rating bureaus (associations that supply actuarial data to member companies). Other actuaries work for private organizations administering independent pension and welfare plans or for government agencies.

Training, Other Qualifications, and Advancement

A good educational background for a beginning job in a large life or casualty company is a bachelor's degree with a major in mathematics or statistics; a degree in actuarial science is even better. Some companies hire applicants with a major in engineering, economics, or business administration, provided the applicant has a working knowledge of mathematics, including calculus, probability, and statistics (20-25 hours). Courses in accounting, computer science, economics, and insurance also are useful. Companies prefer well-rounded individuals with a liberal arts background, including social science and communication, in addition to a good technical background. Although only 34 colleges and universities offer a degree in actuarial science, several hundred schools offer a degree in mathematics or statistics.

A strong background in mathematics is essential for persons interested in a career as an actuary. It is an advantage to pass, while still in school, one or more of the examinations offered by professional actuarial societies. Three societies sponsor programs leading to full professional status in their specialty. The Society of Actuaries gives 10 actuarial examinations for the life and health insurance and pension field; the Casualty Actuarial Society gives 10 examinations for the property and liability field; and the American Society of Pension Actuaries gives 9 examinations covering the pension field. Because the first parts of the examination series of each society cover similar materials, students need not commit themselves to a specialty until they have taken three examinations. These test competence in subjects such as linear algebra, numerical methods, operations research, probability, calculus, and statistics. These first few examinations help students evaluate their potential as actuaries, and those who pass usually have better opportunities for employment and higher starting salaries.

Actuaries calculate probabilities of death, disability, sickness, injury, and retirement.

Actuaries are encouraged to complete the entire series of examinations as soon as possible; completion generally takes from 5 to 10 years. Many students pass two or more actuarial examinations before graduating from college. Examinations are given twice each year. Extensive home study is required to pass the advanced examinations; many actuaries study 20-25 hours a week. Actuaries who complete five examinations in either the life insurance series or the pension series or seven examinations in the casualty series are awarded "associate" membership in their society. Those who pass an entire series receive full membership and the title "fellow."

Consulting pension actuaries who service private pension plans and certify their solvency must be enrolled by the Joint Board for the Enrollment of Actuaries. Applicants for enrollment must meet certain experience and education requirements as stipulated by the Joint Board.

Beginning actuaries often rotate among jobs to learn various actuarial operations and different phases of insurance work. At first, they prepare tabulations for actuarial tables or perform other simple tasks. As they gain experience, they may supervise clerks, prepare correspondence and reports, and do research.

Advancement to more responsible work as assistant, associate, and chief actuary depends largely on job performance and the number of actuarial examinations passed. Actuaries who have a broad knowledge of the insurance, pension, and employee benefits fields often advance to top administrative and executive positions in underwriting, accounting, or data processing departments.

Job Outlook

Employment of actuaries is expected to grow much faster than the average for all occupations through the mid-1990's. Most job openings, however, are expected to arise each year to replace actuaries who transfer to other occupations, retire, or stop working for other reasons. Job opportunities should be favorable for college graduates who have passed at least two actuarial examinations while still in school and have a strong mathematical and statistical background.

Employment in this occupation is influenced by the volume of insurance sales and pension plans, which is expected to grow over the next decade. Shifts in the age distribution of the population will result in a large increase in the number of people with established careers and family responsibilities. This is the group that traditionally has accounted for the bulk of private insurance sales.

As people live longer, they draw health and pension benefits for a longer period, and more actuaries are needed to recalculate the probabilities of such factors as death, sickness, and length of retirement. As insurance companies branch out into more than one kind of insurance coverage, more actuaries will be needed to establish rates. Growth in new forms of protection, such as dental, prepaid legal, and kidnap insurance also will stimulate demand. As more States pass competitive rating laws, many companies that previously relied on rating bureaus for actuarial data may create their own actuarial departments or use the services of consulting actuaries.

The liability of companies for damage resulting from their products has received much attention in recent years. Actuaries will continue to be involved in the development of product liability insurance, as well as medical malpractice and workers' compensation coverage.

Insurance coverage is considered a necessity by most individuals and businesses, regardless of economic conditions. Therefore, actuaries are unlikely to be laid off during a recession.

Earnings

In 1984, new college graduates entering the life insurance field without having passed any actuarial exams averaged about $18,000-$21,000, according to estimates by the Society of Actuaries. Beginners who had completed the first exam received between $20,000 and $23,000, and those who had passed the second exam averaged between $22,000 and $25,000, depending on geographic location.

Insurance companies and consulting firms give merit increases to actuaries as they gain experience and pass examinations. Actuaries who became associates in 1984 averaged between $30,000 and $35,000 a year; actuaries who became fellows during that year averaged between $40,000 and $50,000. Fellows with additional years of experience can earn substantially more—top actuarial executives received salaries of $55,000 a year and higher.

Related Occupations

Actuaries assemble and analyze statistics in their day-to-day work. Other workers whose jobs involve similar skills include mathematicians, statisticians, economists, financial analysts, and engineering analysts.

Sources of Additional Information

For facts about actuarial qualifications and opportunities, contact:

American Society of Pension Actuaries, 1413 K St. NW., 5th Floor, Washington, D.C. 20005.

Casualty Actuarial Society, One Penn Plaza, 250 West 34th St., New York, N.Y. 10119.

Society of Actuaries, 500 Park Blvd., Suite 440, Itasca, Ill. 60143.

American Academy of Actuaries, 1835 K St. NW., Suite 515, Washington, D.C. 20006.

Computer Systems Analysts

(D.O.T. 012.167-066; 020.062, .067-010, and .224; and 109.067-010)

Nature of the Work

Systems analysts plan and develop methods for computerizing business and scientific tasks or improving computer systems already in use. They may work for the organization that wants to install a system or for a consulting firm that develops systems under contract.

Analysts begin an assignment by discussing the data processing problem with managers or specialists to determine the exact nature of the problem and to break it down into its component parts. If a retail chain wishes to computerize its inventory system, for example, systems analysts will determine what information must be collected, how it is to be processed, and the type and frequency of reports to be produced. After they have defined the goals of the system, they use techniques such as mathematical model building, sampling, and cost accounting to plan the system.

Once a design for the system has been developed, systems analysts prepare charts and diagrams that describe it in terms that managers and other users can understand. They also may prepare a cost-benefit and return-on-investment analysis to help management decide whether the proposed system is satisfactory.

If the system is accepted, systems analysts may determine what computer hardware and software will be needed to set up the system. They also prepare specifications for programmers to follow and work with them to "debug," or eliminate errors from the system. (The work of computer programmers is described elsewhere in the *Handbook.*) The analyst also would design any forms required to collect data and distribute information.

Because the possible uses for computers are so varied and complex, analysts usually specialize in either business, scientific, or engineering applications. Often, they have training or experience in the field in which they develop computer systems.

Some analysts improve systems already in use by developing better procedures or adapting the system to handle additional types of data. Others do research, called advanced systems design, to devise new methods of systems analysis.

Working Conditions

Systems analysts work in offices in comfortable surroundings. They usually work about 40 hours a week—the same as other professional and office workers. Occasionally, however, evening or weekend work may be necessary to meet deadlines.

Employment

Systems analysts held about 308,000 jobs in 1984. Most systems analysts work in urban areas for firms that manufacture durable goods, government agencies, banks, and insurance companies, and data processing service firms.

Jobs for systems analysts are found throughout the country. Compared to the total work force, a larger proportion of system analysts work in the Northeast and West reflecting the concentration of computer manufacturing and data processing service firms in these regions.

Training, Other Qualifications, and Advancement

There is no universally accepted way of preparing for a job as a systems analyst because employers' preferences depend on the work being done.

Systems analysts must prepare specifications for programmers to follow.

However, college graduates almost always are sought for these jobs; and, for some of the more complex jobs, persons with graduate degrees are preferred. Employers usually want analysts with a background in accounting or business management for work in a business environment, while a background in the physical sciences, applied mathematics, or engineering is preferred for work in scientifically oriented organizations. Many employers seek applicants who have a degree in computer science, information science, computer information systems, or data processing. Regardless of college major, employers look for people who are familiar with programming languages. Courses in computer concepts, systems analysis, and data base management systems offer good preparation for a job in this field.

Prior work experience is important. About 7 out of 10 persons entering this occupation typically transfer from other occupations, such as engineer, manager, and computer programmer.

Systems analysts must be able to think logically, have good communication skills, and like working with ideas and people. They often deal with a number of tasks simultaneously. The ability to concentrate and pay close attention to detail also is important. Although systems analysts often work independently, they also work in teams on large projects. They must be able to communicate effectively with technical personnel, such as programmers and managers, as well as with people who have no computer background.

Technological advances come so rapidly in the computer field that continuous study is necessary to keep skills up to date. Training usually takes the form of 1- and 2-week courses offered by employers and software vendors. Additional training may come from professional development seminars offered by professional computing societies.

Indications of experience and professional competence are the Certificate in Data Processing (CDP) and Certificate of Systems Professional (CSP). These designations are conferred by the Institute for Certification of Computer Professionals upon candidates who have 5 years of experience and who have passed a five-part examination.

Systems analysts may be promoted to senior or lead systems analysts after several years of experience. Systems analysts who show leadership ability also can advance to jobs as managers of data processing departments. Systems analysts with several years of experience may start their own computer consulting firms.

Job Outlook

Employment of systems analysts is expected to grow much faster than the average for all occupations through the mid-1990's. The demand for systems analysts is expected to rise as advances in technology lead to new applications for computers. Factory and office automation, telecommunications, and scientific research are just a few areas where use of computer systems will expand. About half of all job openings for systems analysts will result from replacement needs—although a smaller proportion of systems analysts than of all professional workers leave their occupation each year. Most of the systems analysts who leave the occupation transfer to other jobs such as manager or engineer.

College graduates who have had courses in computer programming, systems analysis, and other data processing areas as well as training or experience in an applied field should enjoy the best prospects for employment. Persons without a college degree and college graduates unfamiliar with data processing will face competition from the large number of experienced workers seeking jobs as systems analysts.

Earnings

Median weekly earnings of systems analysts who worked full time in 1984 were about $600. The middle 50 percent earned between $485 and $745 a week. The lowest 10 percent earned less than $345; the highest tenth, more than $870.

Earnings for beginning systems analysts in private industry averaged about $490 a week in 1984, according to a survey conducted in urban areas by the Bureau of Labor Statistics. Experienced workers earned about $585, and lead systems analysts earned about $690 weekly. In the Federal Government, the entrance salary for recent college graduates with a bachelor's degree was about $345 a week in early 1985.

Systems analysts working in the West had the highest earnings and those in the South, the lowest. Generally, earnings were greater in transportation, public utilities, and manufacturing than in finance, trade, and services.

Related Occupations

Other workers in applied mathematics, business, and science who use logic and reasoning ability to solve problems are programmers, financial analysts, urban planners, engineers, mathematicians, operations research analysts, and actuaries.

Sources of Additional Information

Further information about the occupation of systems analyst is available from:

Association for Systems Management, 24587 Bagley Rd., Cleveland, Ohio 44138.

Data Processing Management Association, 505 Busse Hwy., Park Ridge, Ill. 60068.

Mathematicians

(D.O.T. 020.067-014, .187-018; 199.267-014)

Nature of the Work

Mathematicians work in one of the oldest and most basic sciences. Mathematicians today are engaged in a wide variety of activities, ranging from the creation of new theories to the translation of scientific and managerial problems into mathematical terms.

Mathematical work falls into two broad classes: Theoretical (pure) mathematics; and applied mathematics. However, these classes are not sharply defined and often overlap.

Theoretical mathematicians advance mathematical science by developing new principles and new relationships between existing principles of mathematics. Although they seek to increase basic knowledge without necessarily considering its practical use, this pure and abstract knowledge has been instrumental in producing many scientific and engineering achievements. For example, in 1854, G.F.B. Riemann invented a seemingly impractical non-Euclidian geometry that was to become part of Albert Einstein's theory of relativity. Years later, this theory contributed to the creation of atomic power.

Applied mathematicians use mathematics to develop theories, techniques, and approaches to solve practical problems in business, government, engineering, and the natural and social sciences. Their work ranges from analysis of the mathematical aspects of launching communications satellites to studies of the effects of new drugs on disease.

Much work in applied mathematics, however, is carried on by persons other than mathematicians. In fact, the number of workers using mathematical techniques is many times greater than the number actually designated as mathematicians.

Working Conditions

Mathematicians working for government agencies and private firms have structured work schedules. They may work alone with only computers, calculators, and mathematical formulas as company. Or they may be an integral part of a research team that includes engineers, computer scientists, and others. Deadlines, overtime work, special requests for information, and travel to attend seminars or conferences may be part of their jobs.

Mathematics faculty have flexible work schedules, dividing their time among teaching, research, consulting, and administrative responsibilities.

Employment

Mathematicians held about 21,000 jobs in 1984. In addition, about 32,000 persons held mathematics faculty positions in colleges and universities. (See the statement on college and university faculty elsewhere in the *Handbook.*)

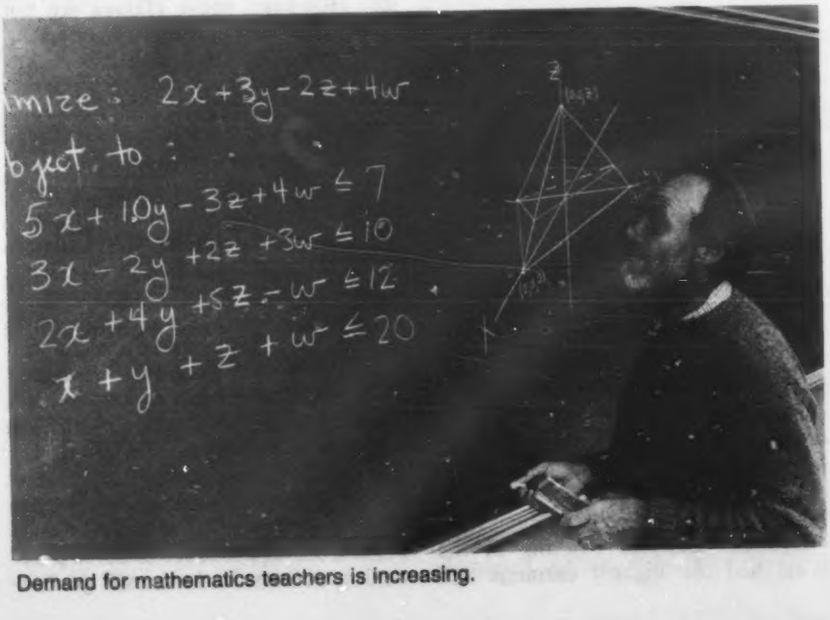
Most mathematicians worked in the government—primarily Federal—and in service and manufacturing industries. The Department of Defense and the National Aeronautics and Space Administration are the primary employers of mathematicians working in the Federal Government. Major employers within the services sector were miscellaneous business services, including research and development laboratories; educational services; and noncommercial educational and research organizations. Within manufacturing, guided missiles and space vehicles; aircraft; and office, computing, and accounting machine industries provided the most jobs.

Mathematicians work in all States but are concentrated in those with high-technology industries.

Training, Other Qualifications, and Advancement

An advanced degree is the preferred requirement for beginning teaching jobs, as well as for most research positions. However, in most 4-year colleges and universities, the Ph.D. degree is necessary for full faculty status. The master's degree is generally the minimum requirement for teaching jobs in 2-year and small 4-year colleges.

A bachelor's degree is considered adequate preparation for some jobs in private industry and government. Individuals with this background usually assist senior mathematicians by performing computations and solving less advanced problems in applied mathematics. The majority of bachelor's degree holders work in related fields such as computer science where employment opportunities are rapidly expanding. However, an advanced degree is a prerequisite for the more responsible positions. Many research positions require the doctorate.



Demand for mathematics teachers is increasing.

The bachelor's degree in mathematics is offered by most colleges and universities. Mathematics courses usually required for a degree are analytical geometry, calculus, differential equations, linear algebra, probability theory and statistics, mathematical analysis, and modern algebra. Many colleges and universities urge or even require students majoring in mathematics to take several courses in a field that uses or is closely related to mathematics, such as computer science, operations research, a physical science, or economics. A double major in mathematics and computer science or mathematics and statistics is particularly desirable. A prospective college mathematics student should take as many mathematics courses as possible while in high school.

About 470 colleges and universities offer the master's degree in mathematics; nearly 200 also offer the Ph.D. In graduate school, students conduct research and take advanced courses, usually in a specific field of mathematics such as algebra, mathematical analysis, or geometry.

For work in applied mathematics, training in the field in which the mathematics will be used is very important. Fields in which applied mathematics is used extensively include physics, actuarial science, engineering, and operations research; of increasing importance are computer and information science, business and industrial management, economics, statistics, chemistry and life sciences, and the behavioral sciences.

Mathematicians should have a working knowledge of computer programming since most complex mathematical computation is done by computer.

Mathematicians need good reasoning ability, persistence, and the ability to apply basic principles to new types of problems. They must be able to communicate well since they often need to discuss the problem to be solved with nonmathematicians.

Job Outlook

Employment of mathematicians is expected to increase about as fast as the average for all occupations through the mid-1990's. Most job openings, however, will arise from the need to replace experienced mathematicians who transfer to other occupations, retire, or leave the labor force for other reasons.

The shortage of Ph.D.'s in mathematics is expected to continue, resulting in favorable employment opportunities. In industry, holders of the doctorate in applied mathematics have better employment prospects than their theoretically oriented colleagues. Holders of the doctorate in theoretical mathematics should continue to have good opportunities for teaching and research jobs in colleges and universities.

Industry and government agencies will need mathematicians for work in operations research, mathematical modeling, numerical analysis, computer systems design and programming, information and data processing, applied mathematical physics, robotics, market research, commercial surveys, and as consultants in industrial laboratories.

Holders of a master's degree in mathematics may have difficulty finding a job in college teaching or theoretical research. However, there will be many openings in applied areas such as computer science and data processing.

Bachelor's degree holders in mathematics with a strong background—preferably a double major—in computer science should have very good opportunities in computerized data processing activities in industry. Those who meet State certification requirements may become high school mathematics teachers, who are currently in short supply. (For additional information, see the statement on secondary school teachers elsewhere in the *Handbook*.)

Earnings

According to a 1984 College Placement Council Survey, starting salary offers for mathematics graduates with a bachelor's degree averaged about $23,400 a year; for those with a master's degree, $28,800; and for new graduates having the Ph.D., $35,600. The average annual salary for all working mathematicians was about $35,400 in 1984.

In the Federal Government in 1985, the average starting salary for mathematicians having the bachelor's degree and no experience was either $14,400 or $17,800 a year, depending on their college records. Those with the master's degree averaged $21,800 or $26,400; and persons having the Ph.D. degree started at either $26,400 or $31,600. The average salary for all mathematicians in the Federal Government was about $36,900 in 1984.

Related Occupations

A degree in mathematics generally qualifies one to enter related occupations such as actuarial scientist, statistician, computer programmer, systems analyst, and operations research analyst. In addition, a strong background in mathematics facilitates employment in fields such as engineering, economics, finance, and genetics.

Sources of Additional Information

Several brochures are available that give facts about the field of mathematics, including career opportunities, professional training, and colleges and universities with degree programs.

Seeking Employment in the Mathematical Sciences is available for $2, and $2 for additional pairs of copies, from:

American Mathematical Society, P.O. Box 6248, Providence, R.I. 02940.

Professional Opportunities in Mathematics is available for $1.50 from:

Mathematical Association of America, 1529 18th St. NW., Washington, D.C. 20036.

For specific information on careers in applied mathematics, contact:

Society for Industrial and Applied Mathematics, 1405 Architects Building, 117 S. 17th St., Philadelphia, Pa. 19103.

For information on a career as a mathematical statistician, contact:

Institute of Mathematical Statistics, 3401 Investment Blvd., No. 7, Hayward, Calif. 94545.

Information on Federal job opportunities is available from area offices of the State employment service and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

For information about careers in noncollegiate academic institutions, contact:

National Council of Teachers of Mathematics, 1906 Association Dr., Reston, Va. 22091.

Statisticians

(D.O.T. 020.067-022, .167-026)

Nature of the Work

Statistics are numbers that are assembled, classified, and tabulated to help describe the characteristics of the world and its inhabitants. Statisticians devise, carry out, and interpret the numerical results of surveys and experiments. In doing so, they apply their knowledge of statistical methods to a particular subject area, such as economics, human behavior, natural science, or engineering. They may use statistical techniques to predict population growth or economic conditions, develop quality control tests for manufactured products, analyze legal and social problems, or help business managers and government officials make decisions and evaluate the results of new programs.

Often statisticians are able to obtain accurate information about a group of people or things by surveying a small portion, called a sample, of the group. For example, to determine the size of the total audience, television rating services ask only a few thousand families, rather than all viewers, what programs they watch. Statisticians decide where and how to get the data, determine the type and size of the sample group, and develop the survey questionnaire or reporting form. They also prepare instructions for workers who will tabulate the returns.

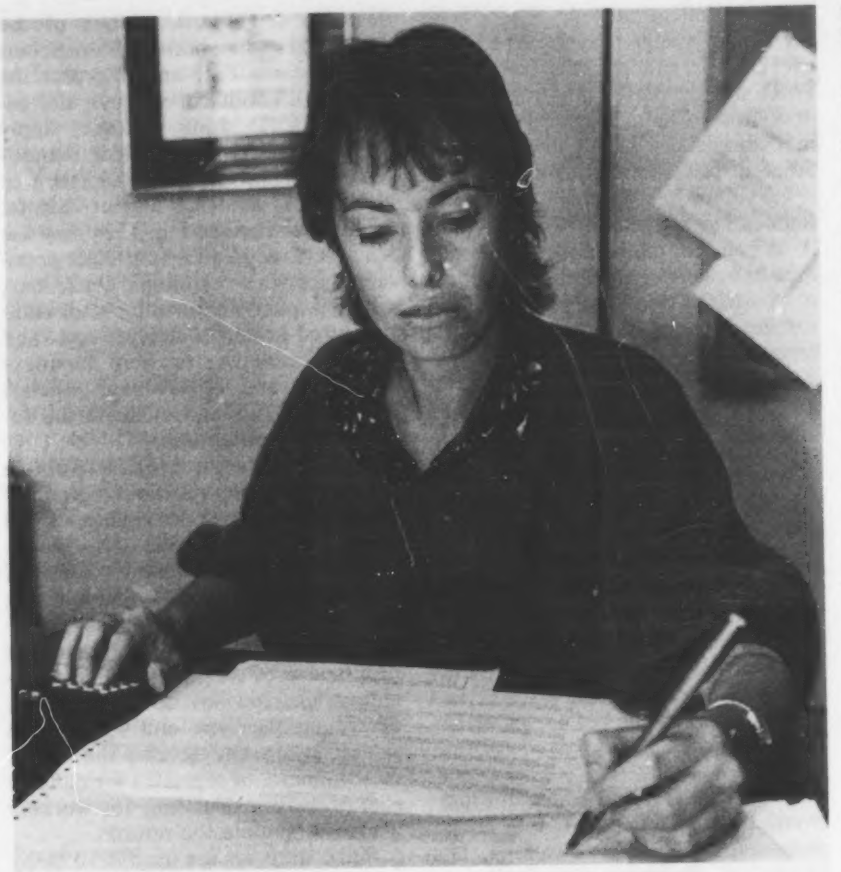
Since statistics are used in so many areas, it sometimes is difficult to distinguish statisticians from specialists in other fields who use statistics. For example, a statistician working with data on economic conditions may have the title of economist.

Working Conditions

Statisticians usually work regular hours in offices. Some statisticians may travel occasionally to supervise or set up a survey, or to gather statistical data. Some may have fairly repetitive tasks, while others may have a variety of tasks, such as in designing a survey.

Employment

Statisticians held about 23,000 jobs in 1984. About 2 out of 3 of these jobs were in industry, primarily in manufacturing, finance, and insurance companies and in business service establishments such as consultants' offices. About one-third were in Federal, State, or local government. Federally employed statisticians were concentrated in the Departments of Commerce, Agriculture, Defense, Health and Human Services, and Labor. Others worked in hospitals, colleges and



Statisticians determine the size of the sample to be surveyed.

universities, and nonprofit organizations.

Although statisticians work in all parts of the country, most are in metropolitan areas such as New York City; Washington, D.C.; and Los Angeles-Long Beach, Calif.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in statistics or mathematics is the minimum educational requirement for many beginning jobs in statistics. For other entry level statistical jobs, a bachelor's degree with a major in an applied field such as economics or a life science and a minor in statistics is preferable. Teaching and research positions in institutions of higher education and some research positions in private industry require a graduate degree in statistics.

Over 200 colleges and universities offered statistics as a concentration for a bachelor's degree in 1984. Many schools also offer either a degree in mathematics or a sufficient number of courses in statistics to qualify graduates for beginning positions. Required subjects for statistics majors include mathematics through differential and integral calculus, statistical methods, and probability theory. Due to the increasing use of computers for statistical applications, a strong background in computer science is highly recommended; a double major in statistics and computer science is particularly desirable. For quality-control positions, training in engineering or physical or biological science is desirable. For many market research, business analysis, and forecasting jobs, courses in economics and business administration are helpful.

In 1984, over 100 universities offered master's and doctoral degree programs in statistics; a small number offered only the master's degree. Many schools offer graduate-level courses in applied statistics for students majoring in biology, business, economics, education, psychology, and other fields. Acceptance into graduate statistics programs does not require an undergraduate degree in statistics although a good mathematics background is essential.

Beginning statisticians who have only the bachelor's degree often spend much of their time doing routine work supervised by an experienced statistician. Through experience, they may advance to positions of greater technical and supervisory responsibility. However, opportunities for promotion are best for those with advanced degrees.

Job Outlook

Employment opportunities for persons who combine training in statistics with knowledge of computer science or a field of application are expected to be favorable through the mid-1990's. Although growth will be average in this field, most openings are expected to result from the need to replace experienced statisticians who transfer to other occupations, retire, or leave the labor force for other reasons.

Private industry will require increasing numbers of statisticians for quality control in manufacturing processes such as motor vehicle and chemical production. Pharmaceutical firms will need more statisticians to assess the effectiveness of the rapidly expanding number of drugs. Statisticians with knowledge of engineering and the physical sciences will find jobs working with scientists and engineers in research and development. Business firms will rely more heavily than in the past on statisticians to forecast sales, analyze business conditions, modernize accounting procedures, and help solve management problems. Sophisticated statistical services will increasingly be contracted out to consulting firms.

Federal, State, and local government agencies will need statisticians in fields such as agriculture, demography, transportation, social security, health, education, energy conservation, and environmental quality control.

Persons who graduate with a bachelor's degree in statistics—especially those with a strong background in mathematics and computer science—should encounter little difficulty in finding jobs in private industry. Those who meet State certification requirements may become high school statistics teachers, a newly emerging field. (For additional information, see the statement on secondary school teachers elsewhere in the *Handbook*.)

Master's degree holders in statistics should have very good employment opportunities. Those with backgrounds in computer science should find many openings in computerized data processing activities and in research in private industry. Some may find teaching positions in junior colleges and small 4-year colleges.

Ph.D.'s in statistics have excellent employment prospects, especially in large corporations and in colleges and universities, which are increasingly establishing separate departments of statistics.

Earnings

In the Federal Government in 1985, the average starting salary of statisticians who had the bachelor's degree and no experience was $14,400 or $17,800 a year, depending on their college grades. Beginning statisticians with the master's degree averaged $21,800 or $26,400. Those with the Ph.D. began at $26,400 or $31,600. The average annual salary for statisticians in the Federal Government was about $35,000 in 1984.

Salaries in private industry were lower than those in the Federal Government, according to the limited data available.

Related Occupations

People in numerous occupations work with statistics. Among them are actuaries, computer programmers, computer systems analysts, educators, engineers, environmental scientists, financial analysts, health scientists, information scientists, life scientists, mathematicians, operations researchers, physical scientists, and social scientists.

Sources of Additional Information

For information about career opportunities in statistics, contact:

American Statistical Association, 806 15th St. NW., Washington, D.C. 20005.

For information on a career as a mathematical statistician, contact:

Institute of Mathematical Statistics, 3401 Investment Blvd., No. 7, Hayward, Calif. 94545.

Information on Federal job opportunities is available from area offices of the State employment service and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

For information about careers in noncollegiate academic institutions, contact:

National Council of Teachers of Mathematics, 1906 Association Dr., Reston, Va. 22091.

Physical Scientists

Physical scientists investigate the structure and composition of the earth and the universe. Many physical scientists perform research designed to increase basic scientific knowledge. Others employ the results of research to solve practical problems in developing new products, locating new sources of oil, or forecasting the weather.

This section covers four physical science occupations—chemists; geologists and geophysicists; meteorologists; and physicists and astronomers. Persons who teach the physical sciences in colleges and universities are discussed in the statement on college and university faculty elsewhere in the *Handbook*.

Most physicists have Ph.D.'s. The jobs of many other physical scientists also require a Ph.D., especially research positions, but many jobs in other physical science fields can be entered with a bachelor's or master's degree.

A knowledge of the physical sciences (especially chemistry and physics) is also required by engineers and life scientists; these occupations are discussed elsewhere in the *Handbook*.

Chemists

(D.O.T. 022.061-010 and -014, .137-010 and .161-010)

Nature of the Work

The clothes we wear, the foods we eat, the houses in which we live—in fact, most things that help make our lives better, from medical care to a cleaner environment—result, in part, from the work done by chemists.

Chemists search for and put to practical use new knowledge about substances. Their research has resulted in the development of a tremendous variety of new and improved synthetic fibers, paints, adhesives, drugs, electronic components, lubricants, and other products. They also develop processes which help save energy and reduce pollution, such as improved oil refining methods. Research on the chemistry of living things provides the basis for advances in medicine, agriculture, and other areas.

Most chemists work in research and development. In basic research, chemists investigate the properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances. In applied research and development, they create new products or improve existing ones, often using knowledge gained from basic research. For example, synthetic rubber and plastics have resulted from research on small molecules uniting to form large ones (polymerization).

The process of developing a product begins with descriptions of the characteristics it should have. If similar products exist, chemists test samples to determine their ingredients. If no such product exists, chemists experiment with various substances to develop a product with the required specifications.

Some chemists work in production and inspection. In production, chemists prepare instructions for plant workers which specify the kind and amount of ingredients to use and the exact mixing time for each stage in the process. They also monitor automated processes to ensure proper product yield and quality. At each step, samples are tested for quality to meet industry and government standards. Chemists keep records and prepare reports showing results of tests. Others work as marketing or sales representatives who sell and provide technical information on chemical products.

Chemists often specialize in a subfield of chemistry. *Analytical chemists* determine the structure, composition, and nature of substances, and develop new analytical techniques. Their skills are often used to identify the presence of chemicals—for example, the kinds and amounts of chemical pollutants in air or water. *Organic chemists* study the chemistry of carbon compounds. When combined with other elements, carbon forms a vast number of substances. Many modern commercial products, such as drugs, plastics, and fertilizers have been developed by organic chemists. *Inorganic chemists* study compounds mainly consisting of elements other than carbon. They may, for example, develop materials for electronic components. *Physical chemists* study the physical characteristics of atoms and molecules and investigate how chemical reactions work. This research may result in new and better energy sources.

Biochemists, whose work encompasses both biology and chemistry, are included under biological scientists elsewhere in the *Handbook*.

Working Conditions

Chemists usually work regular hours in offices and laboratories. Some are exposed to health or safety hazards when handling certain chemicals, but there is little risk if proper procedures are followed.

Employment

Chemists held over 85,000 jobs in 1984. Almost three-fifths of all chemists work for manufacturing firms—over one-half of these are in the chemical manufacturing industry; the rest are scattered throughout other manufacturing industries. Chemists also work for State and local governments, primarily in health and agriculture, and for Federal agencies, chiefly the Departments of Defense, Health and Human Resources, and Agriculture. Smaller numbers work for nonprofit research organizations. In addition, about 19,000 persons held chemistry faculty positions in colleges and universities in 1984. (See the statement on college and university faculty elsewhere in the *Handbook*.)

Chemists are employed in all parts of the country, but they are concentrated in large industrial areas.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in chemistry or a related discipline is sufficient for many beginning jobs as a chemist. However, graduate training is required for most research jobs, and most college teaching jobs require a Ph.D. degree. Beginning chemists should have a broad background in chemistry, with good laboratory skills.

Many colleges and universities offer a bachelor's degree program in chemistry. About 580 are approved by the American Chemical Society. In addition to required courses in analytical, inorganic, organic, and physical chemistry, undergraduates usually study mathematics, physics, and liberal arts.

Several hundred colleges and universities award advanced degrees in chemistry. Graduate students generally specialize in a subfield of chemistry. Requirements for a master's and doctor's degree usually include a thesis based on independent research.

Students planning careers as chemists should enjoy studying science and mathematics, and should like working with their hands building scientific apparatus and performing experiments. Perseverance, curiosity, and the ability to concentrate on detail and to work independently are essential.

Graduates with a bachelor's degree generally begin their careers in government or industry by analyzing or testing products, working in technical sales or services, or assisting senior chemists in research and development laboratories. Employers may have training and orientation programs which provide special knowledge needed for the employer's type of work. Candidates for an advanced degree often teach or do research in colleges and universities while working toward their degrees.

Beginning chemists with a master's degree can usually teach in a 2-year college or go into applied research in government or private industry. A Ph.D. generally is required for basic research, for 4-year college faculty positions, and for advancement to many administrative positions.

Many people with a bachelor's degree in chemistry enter other occupations in which a chemistry background is helpful, such as technical writers and manufacturers' sales representatives and wholesale trade sales workers in chemical marketing. Some who hold bachelor's degrees in chemistry enter medical, dental, veterinary, or other health profession schools. Others enter a wide range of occupations with little or no connection to chemistry.

Graduate training is required for most research jobs in chemistry.

Job Outlook

Employment of chemists is expected to grow more slowly than the average for all occupations through the mid-1990's largely because the chemical industry and other industries which employ a large proportion of chemists are expected to grow slowly. However, many openings will result each year as chemists transfer to other occupations or leave the occupation for other reasons.

The majority of job openings are expected to be in private industry, primarily in the development of new products. In addition, industrial companies will need more chemists to do biotechnology research and to develop products and production processes arising from this research.

Little growth in the employment of chemistry faculty in colleges and universities is expected.

Chemistry graduates may become high school teachers. However, they usually are then regarded as science teachers rather than chemists. Others may qualify as engineers, especially if they have taken some courses in engineering. (See statements on secondary school teachers and engineers elsewhere in the *Handbook*.)

Earnings

According to the College Placement Council, chemists with a bachelor's degree were offered starting salaries averaging $21,100 a year in 1984; those with a master's degree, $26,700; and those with a Ph.D., $35,500.

According to the American Chemical Society, salaries of their members with a bachelor's degree who were experienced nonacademic chemists in private industry averaged $34,000 a year in 1984; for those with a master's degree, $39,000; and for those with a Ph.D., $49,000.

In a Bureau of Labor Statistics survey, chemists in private industry averaged $21,600 a year in 1984 at the most junior level, and $63,100 at senior supervisory levels. Experienced midlevel chemists with no supervisory responsibilities averaged $37,600.

Depending on a person's college record, the annual starting salary in the Federal Government in early 1985 for an inexperienced chemist with a bachelor's degree was either $14,390 or $17,824. Those who had 2 years of graduate study began at $21,804 a year. Chemists having a Ph.D. degree started at $26,381 or $31,619. The average salary for all chemists in the Federal Government in 1984 was $36,800 a year.

Related Occupations

The work of chemical engineers, occupational safety and health workers, agricultural scientists, biological scientists, and chemical technicians is closely related to the work done by chemists. The work of other physical and life science occupations may also be similar to that of chemists.

Sources of Additional Information

General information on career opportunities and earnings for chemists is available from:

American Chemical Society, Career Services, 1155 16th St. NW., Washington, D.C. 20036.

Information on Federal job opportunities is available from local offices of State employment services and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

Geologists and Geophysicists

(D.O.T. 024.061 except -014, .161, and .167)

Nature of the Work

Geologists and geophysicists study the physical aspects and history of the earth. They analyze information collected through seismic prospecting, which involves bouncing sound waves off deeply buried rock layers; examine surface rocks and samples of buried rocks recovered by drilling; and study information collected by satellites. They also identify rocks, minerals, and fossils, conduct geological surveys, construct maps, and use instruments such as the gravimeter and magnetometer to measure the earth's gravity and magnetic field. An important application of geological research is locating oil, natural gas, and minerals.

A geologist gathers rock samples.

Geologists and geophysicists examine chemical and physical properties of specimens in laboratories under controlled temperature and pressure. They may study fossil remains of animal and plant life or experiment with the flow of water and oil through rocks. Laboratory equipment used includes instruments such as the X-ray diffractometer, which determines the crystal structure of minerals, and the petrographic microscope, used for close study of rock and sediment samples.

Besides locating natural resources and working in laboratories, geologists and geophysicists also advise construction companies and government agencies on the suitability of proposed locations for buildings, dams, or highways. Some administer and manage research and exploration programs.

The fields of geology and geophysics are closely related but there are some major differences. Geologists study the composition, structure, and history of the earth's crust. They try to find out how rocks were formed and what has happened to them since their formation. Geophysicists use the principles of physics and mathematics to study the earth's internal composition, surface, and atmosphere and also various forces such as its magnetic, electrical, and gravitational fields.

Geologists and geophysicists usually specialize. *Geological oceanographers* study the ocean bottom. They collect information using remote sensing devices aboard ships or sometimes from underwater research craft. *Physical oceanographers* study the physical aspects of oceans such as their currents and their interaction with the atmosphere. *Geochemical oceanographers* study the chemical composition, dissolved elements, and nutrients of oceans. Although biological scientists who study ocean life sometimes are called oceanographers (as well as marine biologists), the work they do is related to biology rather than geology or geophysics. (See the statement on biological scientists elsewhere in the *Handbook*.) *Hydrologists* study the distribution, circulation, and physical properties of underground and surface waters. They may study the form and intensity of precipitation, its rate of infiltration into the soil, and its return to the ocean and atmosphere. *Mineralogists* analyze and classify minerals and precious stones according to composition and structure. *Paleontologists* study fossils found in geological formations to trace the evolution of plant and animal life. *Seismologists* interpret data from seismographs and other instruments which measure small movements of the earth to locate earthquakes and earthquake faults. *Stratigraphers* study the distribution and arrangement of sedimentary rock layers by examining their fossil and mineral content. *Meteorologists* sometimes are classified as geophysical scientists. (See the statement on meteorologists elsewhere in the *Handbook*.)

Working Conditions

Most geologists and geophysicists divide their time between fieldwork and office or laboratory work. While in the field, geologists often travel to remote sites by helicopter or jeep and cover large areas by foot. Exploration geologists and geophysicists often work overseas or in remote areas, and geological and physical oceanographers may spend considerable time at sea. When not working outdoors, geologists are in offices and laboratories.

Employment

Geologists and geophysicists held over 46,000 jobs in 1984. In addition, about 8,500 persons held geology, geophysics, and oceanography faculty positions in colleges and universities. (See the statement on college and university faculty elsewhere in the *Handbook*.)

Over one-half were in oil and gas companies or oil and gas field service firms, many of which are involved in oil and gas exploration. Many other geologists worked for business service and consulting firms, which often provide services to oil and gas companies. About 1 geologist in 6 was self-employed, primarily as an industry or government consultant.

The Federal Government employed almost 7,000 geologists, geophysicists, oceanographers, and hydrologists in 1984. Three-fifths worked for the Department of the Interior in the U.S. Geological Survey, the Bureau of Mines, and the Bureau of Reclamation. Others worked for the Departments of Defense Agriculture, and Commerce. State agencies also employ geologists and geophysicists; some work for State geological surveys and State departments of conservation. Geologists and geophysicists also work for nonprofit research institutions and museums. Some are employed by American firms overseas for varying periods of time.

Training, Other Qualifications, and Advancement

A bachelor's degree in geology or geophysics is adequate for entry into some lower level geology jobs, but better jobs with good advancement potential usually require at least a master's degree in geology or geophysics. Persons with strong backgrounds in physics, mathematics, or computer science also may qualify for some geophysics jobs. A Ph.D degree is essential for most research positions.

Over 500 colleges and universities offer a bachelor's degree in geology or geophysics. Other programs offering training for beginning geophysicists include geophysical technology, geophysical engineering, geophysical prospecting, engineering geology, petroleum geology, and geodesy. In addition, more than 270 universities award advanced degrees in geology or geophysics.

Geologists and geophysicists need to be able to work as part of a team. They should be curious, analytical, and able to communicate effectively. Those involved in fieldwork must have physical stamina.

Geologists and geophysicists usually begin their careers in field exploration or as research assistants in laboratories. They are given more difficult assignment as they gain experience. Eventually they may be promoted to project leader, program manager, or other management and research positions.

Job Outlook

Employment of geologists and geophysicists is expected to grow about as fast as the average for all occupations through the mid-1990's. Most jobs for geologists and geophysicists are in or related to the petroleum industry. This industry has greatly reduced exploration activities because of the recent drop in the price of oil. Steady prices for petroleum and energy conservation will make for little or no growth in petroleum industry employment through the 1980's. However, because new sources of oil and gas must be found eventually, exploration activities should increase by 1995. When this occurs, employment should grow and job opportunities should greatly improve. Furthermore, even with little employment growth, many openings will arise each year to replace geologists and geophysicists who transfer to other occupations or leave the occupation for other reasons.

Geologists and geophysicists who have knowledge and experience in geophysical oil and gas exploration techniques will have better employment opportunities than others. Also, more geologists, especially those with advanced degrees, will be needed to conduct environmentally related research.

Earnings

Median annual earnings of full-time geologists and geophysicists were about $42,000 in 1984, according to limited information. Surveys by the College Placement Council indicate that graduates with bachelor's degrees in physical and earth sciences received average starting offers of $22,800 a year in 1984. Graduates with master's degrees in geology and related geological sciences received average starting offers of $29,300 a year.

In the Federal Government in early 1985, geologists and geophysicists having a bachelor's degree could begin at $14,390 or $17,824 a year, depending on their college records. Those having a master's degree could start at $17,824 or $21,804 a year; those having the Ph.D. degree, at $26,381 or $31,619. In 1984, the average salary for geologists in the Federal Government was about $38,000 a year and for geophysicists, about $40,300 a year.

Related Occupations

Many geologists and geophysicists work in the petroleum and natural gas industry. This industry also employs many other workers who are involved in the scientific and technical aspects of petroleum and natural gas exploration and extraction, including drafters, engineering technicians, science technicians, petroleum engineers, and surveyors. Also related to the work of geologists and geophysicists are other physical science occupations such as physicists, chemists, and meteorologists, as well as mathematicians, computer scientists, and cartographers.

Sources of Additional Information

Information on training and career opportunities for geologists is available from:

American Geological Institute, 4220 King St., Alexandria, Va. 22302.

Information on training and career opportunities for geophysicists is available from:

American Geophysical Union, 2000 Florida Ave. NW., Washington, D.C. 20009.

Society of Exploration Geophysicists, P.O. Box 70240, Tulsa, Okla. 74170.

For information on Federal Government careers, contact:

U.S. Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

Meteorologists

(D.O.T. 025.062-010)

Nature of the Work

Meteorology is the study of the atmosphere, which is the air that surrounds the earth. Meteorologists study the atmosphere's physical characteristics, motions, and processes, and the way the atmosphere affects the rest of our environment. The best known application of this knowledge is in understanding and forecasting the weather. However, weather information and meteorological research also are applied in many other areas, such as air pollution control, fire prevention, agriculture, air and sea transportation, and the study of trends in the earth's climate.

Meteorologists who forecast the weather, known professionally as *operational or synoptic meteorologists*, are the largest group of specialists. They study weather information, such as air pressure, temperature, humidity, and wind velocity, and apply physical and mathematical relationships to make short-range and long-range predictions. Their data come from weather satellites and observers in many parts of the world. Although some forecasters still prepare and analyze weather maps, most data now are plotted and analyzed by computers.

Some meteorologists engage in basic and applied research. For example, *physical meteorologists* study the chemical and physical properties of the atmosphere. They do research on the effect of the atmosphere on transmission of light, sound, and radio waves, and study factors affecting formation of clouds, rain, snow, and oth-

A meteorologist records weather data.

er weather phenomena. Other meteorologists, known as *climatologists*, study trends in climate and analyze past records of wind, rainfall, sunshine, and temperature to determine the general pattern of weather that makes up an area's climate. These studies are used to plan heating and cooling systems, design buildings, and aid in effective land utilization.

Working Conditions

Jobs in weather stations, most of which operate around the clock 7 days a week, often involve night work and rotating shifts. Most stations are at airports or in or near cities; some are in isolated and remote areas. Meteorologists in smaller weather stations generally work alone; in larger ones, they work as part of a team.

Employment

Meteorologists held about 5,500 jobs in 1984. In addition, about 1,000 persons held meteorology faculty positions in colleges and universities. (See the statement on college and university faculty elsewhere in the *Handbook*.)

The largest employer of civilian meteorologists is the National Weather Service, where about 1,800 work at stations in all parts of the United States and in a small number of foreign areas. The Department of Defense employs over 200 civilian meteorologists. A few work for State and local governments and for nonprofit organizations.

In addition to government, private weather consulting firms and engineering services firms employ many meteorologists. Commercial airlines employ meteorologists to forecast weather along flight routes and to brief pilots on atmospheric conditions. Other meteorologists work for radio and television stations and companies that design and manufacture meteorological instruments and aircraft and missiles.

In addition to civilian meteorologists, thousands of members of the Armed Forces do forecasting and other meteorological work.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in meteorology is the usual minimum requirement for beginning jobs in weather forecasting. However, employers prefer to hire those with an advanced degree, and an advanced degree is increasingly necessary for promotion.

For research and college teaching and for many top level positions in other meteorological activities, an advanced degree, preferably in meteorology, is essential. People with graduate degrees in other sciences also may qualify if they have advanced courses in meteorology, physics, mathematics, and chemistry.

Over 100 colleges and universities offer degrees in meteorology. In addition, some departments of physics, earth science, or geophysics also offer many atmospheric science and related courses. Before selecting a degree program in meteorology, students should investigate the particular emphasis of the program, since many meteorology programs are combined with the study of a related scientific or engineering field.

Beginning meteorologists often start in jobs involving routine data collection, computation, or analysis and are given more difficult assignments as they gain experience. Experienced meteorologists may advance to various supervisory or administrative jobs. A few meteorologists establish their own weather consulting services.

Job Outlook

Employment of meteorologists is expected to grow about as fast as the average for all occupations through the mid-1990's. Little or no growth in employment is expected in the National Weather Service, which employs about half of all meteorologists. Most new jobs will be created in private industry as more organizations recognize the value of private weather forecasting and meteorological services. Nevertheless, most of the job openings in this very small occupation will arise from the need to replace those who transfer to other occupations or leave the labor force. Persons with an advanced degree in meteorology should have the best job prospects.

Earnings

The average salary for meteorologists employed by the Federal Government was $39,400 in 1984. In early 1985, meteorologists in the Federal Government with a bachelor's degree and no experience received starting salaries of $14,390 or $17,824 a year, depending on their college grades. Those with a master's degree could start at $17,824 or $21,804; those with the Ph.D. degree, at $26,381 or $31,619.

Related Occupations

Workers in other occupations concerned with the physical environment include foresters and conservation scientists, geologists and geophysicists, and environmental engineers.

Sources of Additional Information

Information on career opportunities in meteorology is available from:

American Meteorological Society, 45 Beacon St., Boston, Mass. 02108.

For facts about job opportunities with the National Weather Service, contact:

National Weather Service/Personnel, 1-RAS/DC23, Rockville, Md. 20782.

Physicists and Astronomers

(D.O.T. 021.067-010, 023.061-010, -014, and .067-010)

Nature of the Work

The flight of the space shuttle, the accuracy of advanced medical instruments, and even the safety of the family car depend on research by physicists. Through systematic observation and experimentation, physicists use mathematical terms to describe the structure and behavior of the universe and the interaction of matter and energy. Physicists also develop theories that describe the fundamental forces and laws of nature. Determining the basic laws governing phenomena such as gravity, electromagnetism, and nuclear interactions leads to discoveries and innovations that advance nuclear energy, electronics, communications, aerospace technology, and medical instrumentation.

Astronomy is usually considered a subfield of physics. Astronomers use the principles of physics and mathematics to answer questions about the fundamental nature of the universe, such as its origin and history and the evolution of the solar system.

Most physicists work in research and development. Some do basic research to increase scientific knowledge. For example, they investigate the structure of the atom or the nature of gravity. The equipment that physicists design for their research can often be applied to other areas. For example, lasers (devices that amplify light and emit it in a highly directional, intense beam) are used in surgery; microwave devices are used for ovens; and measurement techniques and instruments can detect the kind and number of cells in blood or the amount of mercury or lead in foods.

Many physicists conduct applied research and help develop new devices, products, and processes. For instance, their knowledge of solid-state physics led to the development of transistors and then to the integrated circuits used in calculators and computers. A small number work in inspection, testing, quality control, and other production-related jobs in industry. Some do consulting work.

Almost all astronomers do research. Most of their time is spent analyzing the large quantities of data collected by their own and others' observations and writing scientific papers on the results of their research. Most astronomers spend only a few weeks each year making observations with telescopes, radio telescopes, and other instruments (some in orbiting satellites) that can detect electromagnetic radiation from distant sources. Contrary to the popular image, astronomers almost never actually look through a telescope because photographic and electronic radiation detecting equipment is more effective than the human eye.

Most physicists specialize in one or more branches of the science—elementary-particle physics; nuclear physics; atomic, electron, or molecular physics; physics of condensed matter; optics; acoustics; health physics; plasma physics; and the physics of fluids. Some specialize in a subdivision of one of these branches. For example, subdivisions of solid-state physics include superconductivity, crystallography, and semiconductors. However, since all physics involves the same fundamental principles, several specialties may overlap, and in the course of their careers physicists frequently switch from one subfield to another.

Growing numbers of physicists are specializing in fields such as biophysics, chemical physics, and geophysics in which physics and a related science are combined. Furthermore, the practical applications of physicists' work increasingly have merged with engineering.

Working Conditions

Physicists generally work regular hours in laboratories, classrooms, and offices. Most physicists do not encounter unusual hazards in their work. Some physicists need to travel to use national or international facilities such as particle accelerators, and astronomers who make observations may need to travel to observatories, which are usually in remote locations, and frequently work at night.

Employment

Physicists held almost 20,000 jobs in 1984. In addition, almost an equal number of persons held physics faculty positions in colleges and universities. (See the statement on college and university faculty elsewhere in the *Handbook*.) The Federal Government, mostly the Departments of Defense and Commerce, employed about 3 out of 10 physicists. About a quarter worked for independent research and development laboratories. Others worked for electrical equipment manufacturers, noncommercial research laboratories, engineering services firms, and colleges and universities as nonfaculty researchers.

Although physicists are employed in all parts of the country, most are in areas that have heavy industrial concentrations and large college and university enrollments.

Training, Other Qualifications, and Advancement

Graduate training in physics or a closely related field is almost essential for most entry level jobs in physics and for advancement. The doctorate usually is required for full faculty status at colleges and universities and for industrial or government jobs directing research and development programs. A doctorate is also the usual requirement for a job in astronomy.

Those having master's degrees may qualify for some research jobs in private industry and in the Federal Government as well as for teaching jobs in 2-year colleges. In universities, most teach and assist in research while studying for their Ph.D.

Those having bachelor's degrees may qualify for a few applied research and development jobs in private industry and in the Federal Government. Some are employed as research or teaching assistants in colleges and universities while studying for advanced degrees. Many with undergraduate physics degrees work in engineering and other scientific fields. (See statements on engineers, geologists and geophysicists, programmers, and systems analysts elsewhere in the *Handbook*.)

About 750 colleges and universities offer a bachelor's degree in physics.

A physicist adjusts equipment to be used in an experiment.

The undergraduate program provides a broad background in the science and serves as a base for later specialization either in graduate school or on the job. Some typical physics courses are mechanics, electromagnetism, electronics, optics, thermodynamics, and atomic and molecular physics. Students also take many courses in mathematics.

About 250 colleges and universities offer advanced degrees in physics. In graduate school, the student, with faculty guidance, usually works in a specific subfield of physics. Graduate students, especially candidates for Ph.D. degrees, spend a large portion of their time conducting research.

About 70 universities offer the Ph.D. degree in astronomy. These programs include advanced courses in astronomy, physics, and mathematics. Some schools require that graduate students spend several months working at an observatory. The usual qualification for entrance to a graduate program in astronomy is a bachelor's degree in astronomy, physics, or mathematics with a physics minor.

Students planning a career in physics should have an inquisitive mind, mathematical ability, and imagination. They should be able to work on their own, since physicists, particularly in basic research, often receive only limited supervision.

Physicists, especially those who hold less than a Ph.D., often begin their careers doing routine laboratory tasks. After some experience, they are assigned more complex tasks and may advance to work as project leaders or research directors. Some work in top management jobs. Physicists who develop new products or processes sometimes form their own companies or join new firms to exploit their own ideas.

Job Outlook

Employment of physicists is expected to grow more slowly than the average for all occupations through the mid-1990's. Most job openings will arise as physicists transfer to other occupations or leave the occupation for other reasons. Despite projected slower than average growth, employment opportunities may improve if the number of graduate degrees in physics awarded to U.S. citizens continues to decline. Some with advanced degrees in physics will be needed to teach in colleges and universities, but opportunities will be better in private industry.

Many physicists work in research and development (R&D). The anticipated increase in R&D expenditures through 1995 should result in increased employment for physicists. If actual R&D expenditure levels and patterns differ significantly from those assumed, however, the outlook would be altered.

Persons with only a bachelor's degree in physics are not qualified to enter most physicist jobs. However, many with bachelor's degrees in physics find jobs as engineers, technicians, or computer specialists. Others become high school physics teachers. However, they are usually regarded as teachers rather than as physicists. (See the statement on secondary school teachers elsewhere in the *Handbook*.)

Earnings

Starting salaries for physicists in private industry averaged about $30,000 a year in 1984 for those with a master's degree, according to an American Institute of Physics survey of degree recipients; for those with a Ph.D., $37,500.

Depending on their college records, physicists with a bachelor's degree could start in the Federal Government in early 1985 at either $14,390 or $17,824 a year. Beginning physicists having a master's degree could start at $17,824 or $21,804, and those having the Ph.D. degree could begin at $26,381 or $31,619. Average earnings for all physicists in the Federal Government in 1984 were $43,400 a year.

Starting salaries for physics college and university faculty with the Ph.D. averaged $25,000 in 1984, according to the American Institute of Physics. (See the statement on college and university teachers elsewhere in the *Handbook*.) Many faculty physicists supplement their regular incomes by working as consultants and taking on special research projects.

Related Occupations

Physics is closely related to other scientific occupations such as chemistry, geology, and geophysics. Engineers and engineering and science technicians also use a knowledge of the principles of physics in their work.

Sources of Additional Information

General information on career opportunities in physics is available from:

American Institute of Physics, 335 East 45th St., New York, N.Y. 10017.

American Physical Society, 335 East 45th St., New York, N.Y. 10017.

For a pamphlet containing information on careers in astronomy and on schools offering training in the field, send 25 cents to:

Dr. Charles R. Tolbert, Education Officer, American Astronomical Society, Astronomy Dept., University of Virginia, Box 3818 University Station, Charlottesville, Va. 22903.

best copy available

Life Scientists

Life scientists study living organisms and their life processes, such as growth, reproduction, and behavior. They apply knowledge gained from research to specific goals such as the development of drugs, special varieties of plants, and ways of maintaining a cleaner environment. They are concerned with the origin, preservation, and development of life, from the largest animal to the smallest living cell. Biological scientists study the basic life processes of plants and animals, and agricultural scientists apply their knowledge of biology to agricultural problems. Foresters and conservation scientists use their knowledge of life science to manage and conserve the natural resources of forests, rangelands, and soil. Detailed information about training requirements and job outlook in these occupations appears in the three statements that follow.

Agricultural Scientists

(D.O.T. 040.061-010, -014, -018, -038, -042, and -058; 041.061-014, -018, -046, and -082)

Nature of the Work

The work done by agricultural scientists has played an important part in making American agriculture the most productive in the world. Agricultural scientists study farm crops and animals and develop ways of improving their quantity and quality. They look for ways to increase yields with less labor, control pests and weeds more effectively, and conserve soil and water. Agricultural science is closely related to biological science in that both involve the study of living organisms; agricultural scientists then apply this knowledge to solving practical problems in agriculture.

A high proportion of all agricultural scientists manage or administer research and development projects or marketing or production operations in companies that produce agricultural chemicals or machinery. Many do research and development. Some spend most of their time in laboratories, but some in research and development spend much of their time working with plants and animals in the field. Some agricultural scientists work as consultants to business firms or to government.

Agricultural scientists usually specialize in one of the following areas. *Agronomists* (D.O.T. 040.061-010) are concerned with the growth and improvement of field crops. They improve the quality and yield of crops such as corn, wheat, and cotton by developing new growth methods or by controlling diseases, pests, and weeds. Some agronomists may specialize in a particular crop or crop problem.

Animal scientists (D.O.T. 040.061-014) do research on the breeding, feeding, and diseases of domestic farm animals.

Dairy scientists (D.O.T. 040.061-018) and *poultry scientists* (D.O.T. 040.061-042) conduct research on the breeding, feeding, and management of dairy cattle and poultry.

Horticulturists (D.O.T. 040.061-038) work with orchard and garden plants such as fruit and nut trees, vegetables, and flowers. They seek to improve plant culture methods for the beautification of communities, homes, parks, and other areas as well as for increasing crop quality and yields.

Soil scientists (D.O.T. 040.061-058) study soil characteristics, map soil types, and determine the best types of crops for each soil. They study the responses of various types of soils to fertilizers, tillage practices, crop rotation, and other actions which affect the soil.

Animal breeders (D.O.T. 041.061-014) and *plant breeders* (D.O.T. 041.061-082) breed plants and animals to develop and improve their economic and esthetic characteristics.

Entomologists (D.O.T. 041.061-046) study insects and their relation to plant and animal life.

Apiculturists (D.O.T. 041.061-018) study the culture and breeding of bees.

Working Conditions

Agricultural scientists generally work regular hours in offices and laboratories. Some agricultural scientists spend much time outdoors conducting research on farms or agricultural research stations.

Employment

Agricultural scientists held about 20,000 jobs in 1984. In addition, about 17,000 persons held agricultural science faculty positions in colleges and universities in 1984. (See the statement on college and university faculty elsewhere in the *Handbook*.)

Almost half of all agricultural scientists work for Federal, State, or local governments. About 15 percent worked for the Federal Government in 1984, mostly in the Department of Agriculture. Large numbers worked for State governments at State agricultural colleges or agricultural research stations. Some work for agricultural service companies; others work for fertilizer companies, seed companies, and wholesale distribution companies. Over 2,000 agricultural scientists were self-employed in 1984, mainly as consultants.

Training, Other Qualifications, and Advancement

Training requirements for agricultural scientists depend on the specialty and the type of work performed. A Ph.D. degree in an agricultural science specialty is usually required for college teaching, independent research, and for advancement to many administrative and management jobs. A master's degree is sufficient for some jobs in applied research. A bachelor's degree is adequate preparation for some jobs in sales, inspection, and other nonresearch areas, but, in some cases, promotions may be limited for those who hold no higher degree. Those who hold degrees in related sciences such as biology, chemistry, or physics also may enter some agricultural science jobs.

All States have at least one land-grant college which offers agricultural science curriculums. Many other colleges and universities also offer some kind of agricultural science courses. Since some schools may not offer all specialties, students should investi-

Agricultural scientists develop ways of improving crop quantity and quality.

gate carefully the course offerings of the schools they are considering. Requirements for advanced degrees usually include fieldwork and laboratory research as well as classroom studies and preparation of a thesis based on independent research.

Agricultural scientists should be able to work independently or as part of a team and must be able to communicate their findings clearly and concisely, both orally and in writing.

Agricultural scientists who have advanced degrees usually begin in research or teaching jobs. With experience, they may advance to jobs such as supervisors of research programs.

Job Outlook

Employment of agricultural scientists is expected to grow about as fast as the average for all occupations through the mid-1990's. In addition to jobs arising from growth in demand for agricultural scientists, many openings will occur as workers transfer to other occupations or leave the occupation for other reasons.

Many agricultural scientists are supported by Federal funding, which is not expected to grow, but employment of agricultural scientists involved in research may grow rapidly in private industry as advances such as recombinant DNA being made in biotechnology are applied to agriculture.

Employment opportunities in agricultural science for those with only a bachelor's degree are limited. However, a bachelor's degree in agricultural science is useful for occupations such as farmer or farm manager, Cooperative Extension Services worker, agricultural products inspector, technician, or purchasing agent for agricultural commodities, or for employment in businesses that deal with farmers such as fertilizer or seed companies or farm equipment manufacturers.

Earnings

According to the College Placement Council, beginning salary offers for agricultural scientists with a bachelor's degree averaged $17,000 a year in 1984.

In the Federal Government in 1985, agricultural scientists with a bachelor's degree could start at $14,390 or $17,824 a year, depending on their college records. Those having a master's degree could start at $17,824 or $21,804, depending on their academic records or work experience; and those with a Ph.D. degree could begin at $26,381 or $31,619 a year. Agricultural scientists in the Federal Government averaged about $33,600 a year in 1984.

Related Occupations

The work of agricultural scientists is closely related to that of biologists as well as to other natural scientists such as chemists and physicists. It is also related to agricultural production occupations such as farmer and farm manager and to Cooperative Extension Services workers as well as to foresters and conservation scientists. Certain specialties of agricultural science are also related to other occupations. For example, the work of animal scientists is related to that of veterinarians; horticulturists, to landscape architects; and soil scientists, to soil conservationists.

Sources of Additional Information

Information on careers in agricultural science is available from:

Science and Education Higher Education Programs, U.S. Department of Agriculture, Administration Building, 14th St. and Independence Ave. SW., Washington, D.C. 20250.

American Society of Agronomy, 677 S. Segoe Rd., Madison, Wis. 53711.

Crop Science Society of America, 677 S. Segoe Rd., Madison, Wis. 53711.

Soil Science Society of America, 677 S. Segoe Rd., Madison, Wis. 53711.

For information on careers in horticultural science, send a stamped, self-addressed envelope to:

American Society for Horticultural Science, 701 North Saint Asaph St., Alexandria, Va. 22314.

Information on Federal job opportunities is available from local offices of State employment services and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

Biological Scientists

(D.O.T. 041.061, except -010, -014, -018, -046, -054, -070, -074, and -082)

Nature of the Work

Biological scientists study all aspects of living organisms and the relationship of animals and plants to their environment. Although many specialize in some area such as ornithology (the study of birds) or microbiology (the study of microscopic organisms), all have in common the study of life.

Many biological scientists are primarily involved in research and development. Some conduct basic research to increase knowledge of living organisms. Others in applied research use this knowledge in activities such as developing new medicines, increasing crop yields, and improving the environment. Those working in laboratories must be familiar with research techniques and the use of laboratory equipment and computers. Much research, however, is performed outside of laboratories. For example, a botanist may do research in the volcanic valleys of Alaska to see what plants grow there.

Other biological scientists work in management or administration, for example planning and administering programs for testing foods and drugs and directing activities at zoos or botanical gardens. Some work as consultants to business firms or to government, while others test and inspect foods, drugs, and other products or write for technical publications. Some work in sales and service jobs for companies manufacturing chemicals or other technical products. (*See the* statements on manufacturers' sales representatives and wholesale trade sales workers elsewhere in the *Handbook.*)

Recently, advances in basic biological knowledge, especially in genetics, have resulted in a new field called biotechnology which involves recombining the genetic material of animals or plants, enabling them to do things they couldn't do before. For example, the human gene that codes for the production of insulin has been inserted into bacteria, causing them to produce human insulin. This insulin, used by diabetics, is much purer than insulin from animals, the only previous source. Biotechnology has opened up many new research opportunities and commercial applications of biological science. An increasing portion of the world's drugs, food, and chemicals will probably be produced using biotechnology processes, which may lead to major medical advances.

Most biological scientists who come under the broad category of *biologist* (D.O.T. 041.061-030) are further classified by the type of organism they study or by the specific activity they perform.

Biochemists (D.O.T. 041.061-026) study the chemical composition of living things. They try to understand the complex chemical combinations and reactions involved in metabolism, reproduction, growth, and heredity.

Botanists (D.O.T. 041.061-038) deal primarily with plants and their environment. Some study all aspects of plant life, while others specialize in areas such as identification and classification of plants, the structure and function of various plant parts, the biochemistry of plant processes, and the causes and cures of plant diseases.

Microbiologists (D.O.T. 041.061-058) investigate the growth and characteristics of microscopic organisms such as bacteria, viruses, and molds. *Medical microbiologists* study the relationship between bacteria and disease or the effect of antibiotics on bacteria. Other microbiologists specialize in soil bacteriology (the effect of microorganisms on soil fertility), virology (viruses), or immunology (mechanisms that fight infections).

Physiologists (D.O.T. 041.061-078) study life functions of plants and animals under normal and abnormal conditions. Physiologists may specialize in functions such as growth, reproduction, photosynthesis, respiration, or movement, or in the physiology of a certain area or system of the body.

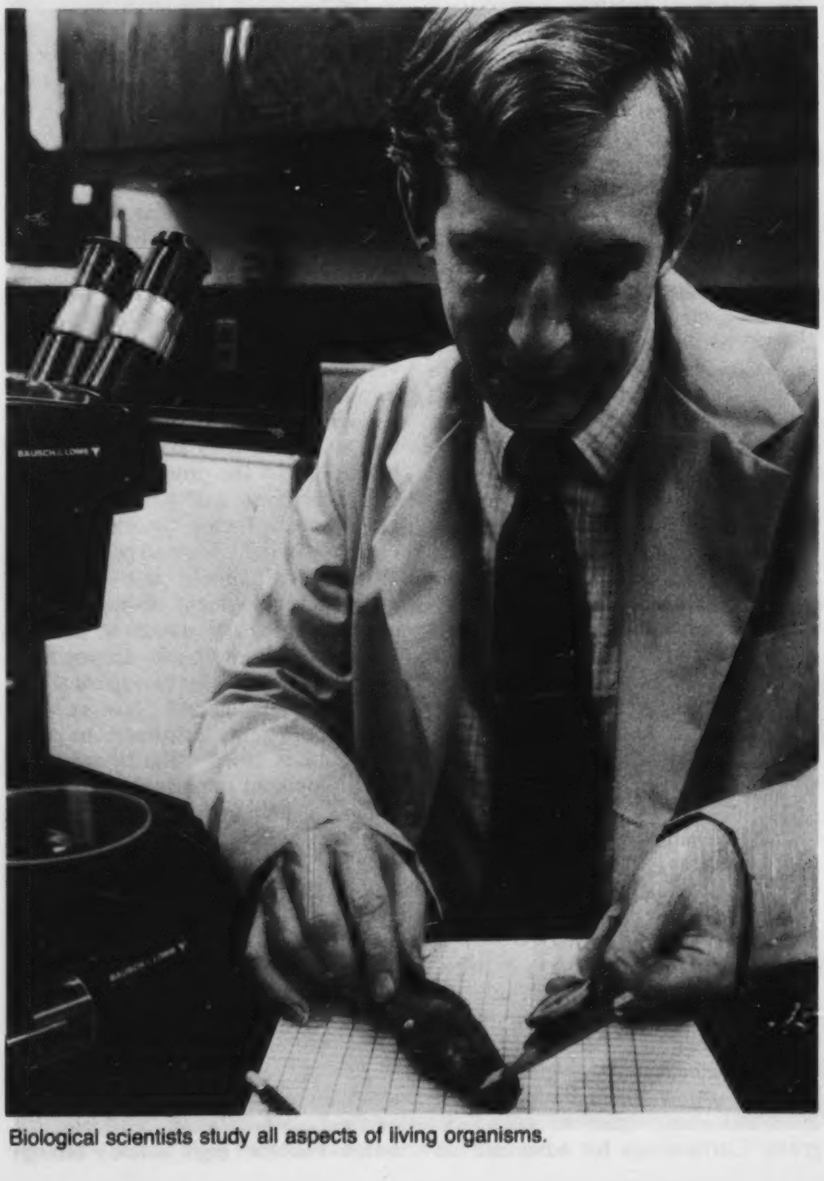
Zoologists (D.O.T. 041.061-090) study various aspects of animals—their origin, behavior, diseases, and life processes. Some experiment with live animals in controlled or natural surroundings while others dissect dead animals to study their structure. Zoologists are usually identified by the animal group studied—ornithologists (birds), mammalogists (mammals), herpetologists (reptiles), and ichthyologists (fish).

Some biological scientists apply their knowledge to a number of areas and may be classified by the functions performed. *Ecologists*, for example, study the relationship between organisms and their environments and the effects of influences such as pollutants, rainfall, temperature, and altitude on organisms. For example, ecologists examine plankton (microscopic water plants and animals) and measure the radioactive content of fish to determine the effects of pollution.

Agricultural scientists, who may also be classified as biological scientists, are included in a separate statement elsewhere in the *Handbook*.

Working Conditions

Biological scientists generally work regular hours in offices, laboratories, or classrooms and usually are not exposed to unsafe or unhealthy conditions. However, some work with dangerous organisms or toxic substances in the laboratory. They could be exposed if safety procedures are not followed. Many biological scientists such as botanists, ecologists, and zo-



Biological scientists study all aspects of living organisms.

ologists take field trips which involve strenuous physical activity and primitive living conditions.

Employment

Biological scientists held over 54,000 jobs in 1984. In addition, an almost equal number of persons held biology faculty positions in colleges and universities. (See the statement on college and university faculty elsewhere in the *Handbook*.)

Over one-third of all biological scientists worked in private industry, mostly in commercial research and development laboratories and the pharmaceutical, chemical, and food industries. About one-tenth worked in nonteaching positions in colleges and universities, and others worked for nonprofit research organizations and foundations or hospitals.

Over one-quarter worked for the Federal Government, mainly in the Departments of Agriculture, Interior, and Defense, and in the National Institutes of Health. State and local governments employed about 1 in 6. A few were self-employed.

Training, Other Qualifications, and Advancement

The Ph.D. degree generally is required for college teaching, independent research, and for advancement to administrative research positions and other management jobs. A master's degree is sufficient for some jobs in applied research. The bachelor's degree is adequate preparation for some beginning jobs, but promotions often are limited for those who hold no higher degree. Some new graduates with a bachelor's degree start their careers as biological scientists in testing and inspecting jobs, or get jobs related to biological science such as technical sales or service representatives. They also can become senior biology technicians, medical laboratory technologists and technicians or, with courses in education, high school biology teachers. (See the statement on secondary school teachers elsewhere in the *Handbook*.) Many with a bachelor's degree in biology enter medical, dental, veterinary, or other health profession schools. Some enter a wide range of occupations with little or no connection to biology.

Most colleges and universities offer bachelor's degrees in biological science and many offer advanced degrees. Curriculums for advanced degrees in biological science often emphasize a particular area of biological science such as microbiology or botany because it is almost impossible to gain a detailed knowledge of all areas of biological science. Not all universities offer all curriculums. Requirements for advanced degrees usually include fieldwork and laboratory research as well as classroom studies and preparation of a thesis. Biological scientists who have advanced degrees usually begin in research or teaching jobs. With experience, they may advance to jobs such as supervisors of research programs.

Prospective biological scientists should be able to work independently or as part of a team and must be able to communicate their findings clearly and concisely, both orally and in writing. Biological scientists conducting field research in remote areas must have physical stamina.

Job Outlook

Employment of biological scientists is expected to increase about as fast as the average for all occupations through the mid-1990's due to recent advances in genetic research that could lead to new drugs, improved plants, and medical discoveries. Advances in biotechnology should result in many additional research jobs for biological scientists in private industry; additional jobs also are likely to be created by the production, by biological methods, of products which are presently made by chemical or other methods. Efforts to preserve the environment should also result in growth. Employment of biologists is expected to grow slowly in government. In addition to jobs arising from growth in demand for biological scientists, job openings will occur as some biological scientists transfer to other occupations or leave the labor force.

Employment opportunities for biological scientists are expected to be better for those with advanced degrees, but the employment outlook will vary by specialty. Those who have the ability to do research related to the genetic, cellular, and biochemical areas of biology should experience better employment opportunities than those in other specialties. However, many persons with a bachelor's degree in biological science find jobs as science or engineering technicians or medical laboratory technologists. Some become high school biology teachers. However, they are usually regarded as teachers rather than biologists.

Biological scientists rarely lose their jobs during recessions, since most are employed on long-term research projects or in agriculture, activities which are not much affected by economic fluctuations.

Earnings

According to the College Placement Council, beginning salary offers in private industry in 1984 averaged $16,800 a year for bachelor's degree recipients in biological science.

In the Federal Government in 1985, biological scientists having a bachelor's degree could begin at $14,390 or $17,824 a year, depending on their college records. Those having the master's degree could start at $17,824 or $21,804, depending on their academic records or work experience; those having the Ph.D. degree could begin at $26,318 or $31,619 a year. Biological scientists in the Federal Government averaged $35,500 a year in 1984.

Related Occupations

Many occupations are related in some way to the work of biological scientists since they deal with living organisms. These include the conservation occupations of forester, forestry technician, range manager, and soil conservationist, as well as agricultural scientist, soil scientist, oceanographer, and life science technician. The wide array of health occupations are all related to those in the biological sciences, as are occupations dealing with raising plants and animals such as farmer and farm worker, florist, and nursery worker.

Sources of Additional Information

General information on careers in biological science is available from:

American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, Va. 22209.

American Physiological Society, Membership Services Dept., 9650 Rockville Pike, Bethesda, Md. 20814.

Dr. David L. Dilcher, Secretary, Botanical Society of America, Dept. of Biology, Indiana University, Bloomington, Ind. 47405.

American Society of Zoologists, P.O. Box 2739, California Lutheran College, Thousand Oaks, Calif. 91360.

For information on careers in biochemistry, contact:

American Society of Biological Chemists, 9650 Rockville Pike, Bethesda, Md. 20814.

For information on careers in microbiology, contact:

American Society for Microbiology, 1913 I St. NW., Washington, D.C. 20006.

Information on Federal job opportunities is available from local offices of State employment services and the U.S. Office of Personnel Management or from Federal Job Information Centers located in various large cities throughout the country.

Foresters and Conservation Scientists

(D.O.T. 040.061-030, -034, -046, -050, -054, and -062; .261; 049.127; and 169.167-022)

Nature of the Work

Forests and rangelands serve a variety of needs: They provide habitats for wildlife, serve as sites for recreational activities, and supply lumber, livestock forage, minerals, and water. Foresters and conservation scientists manage, develop, and help protect these and other natural resources.

Foresters plan and supervise the growing, protection, and harvesting of trees. They map forest areas, estimate the amount of standing timber and future growth, and manage timber sales. Foresters also protect the trees from fire, harmful insects, and disease. Some foresters also protect wildlife and manage watersheds; develop and supervise camps, parks, and grazing lands; and do research. Foresters in extension work provide information to forest owners and to the general public.

Range managers, also called *range conservationists, range ecologists*, or *range scientists*, manage, improve, and protect rangelands to maximize their use without damaging the environment. Rangelands cover more than 1 billion acres of the United States, mostly in the Western States and Alaska. They contain many natural resources: Grass and shrubs for animal grazing, wildlife habitats, water from vast watersheds, recreation facilities, and valuable mineral and energy resources. Rangelands also serve as areas for scientific study of the environment. Range managers help ranchers attain optimum livestock production by determining the number and kind of animals to graze, the grazing system to use, and the best season for grazing. At the same time, however, they try to conserve the soil and vegetation for other uses such as wildlife habitats and outdoor recreation.

Soil conservationists provide technical assistance to farmers, ranchers, and others concerned with the conservation of soil, water, and related natural resources. They develop programs that are designed to get the most productive use of land without damaging it. Soil conservationists do most of their work in the field. Conservationists visit areas with erosion problems, find the source of the problem, and develop programs to combat it.

Foresters and conservation scientists often specialize in one area of work, such as timber management, outdoor recreation, or forest economics.

Working Conditions

Working conditions for foresters and conservation scientists vary considerably. Their image as solitary horseback riders singlehandedly protecting large areas of land far from civiliza-

Foresters protect trees from harmful insects and disease.

tion no longer holds true. Modern foresters and conservation scientists spend a great deal of time working with people. They deal regularly with landowners, loggers, forestry technicians and aides, farmers, and ranchers.

The work can still be physically demanding, though. Many foresters and conservation scientists often work outdoors in all kinds of weather, sometimes in remote areas. To get to these areas, they use airplanes, helicopters, four-wheel drive vehicles, and horses. Foresters and conservation scientists also may work long hours fighting fires or on search-and-rescue missions.

Employment

Foresters and conservation scientists held more than 25,000 jobs in 1984. Over one-half worked for the Federal Government, primarily in the Department of Agriculture. About one-fifth worked for State governments. The remainder worked in private industry, mainly for lumber, paper, and logging companies, and for local governments and consulting firms. A few were self-employed either as consultants or forest owners.

Most soil conservationists work for the Federal Government, mainly with the Department of Agriculture's Soil Conservation Service.

Although foresters and conservation scientists work in every State, employment is concentrated in the Western and Southeastern States where many national forests and parks are located and where most of the lumber and pulpwood producing forests are located. Range managers work almost entirely in the Western States where most of the rangeland is located. Soil conservationists, on the other hand, are employed in almost every county in the country.

Training, Other Qualifications, and Advancement

A bachelor's degree in forestry is the minimum educational requirement for professional careers in forestry. However, due to keen job competition and the increasingly complex nature of the forester's work, many employers prefer graduates who hold advanced degrees. Certain jobs such as teaching and research require advanced degrees.

In 1984, about 50 colleges and universities offered bachelor's or higher degrees in forestry; 46 of these were accredited by the Society of American Foresters. Curriculums stress the liberal arts and communications skills as well as technical forestry subjects. Courses in forest economics and business administration supplement the student's scientific and technical knowledge. Many colleges require students to spend one summer in a field camp operated by the college. All schools encourage summer jobs that give experience in forest or conservation work.

A bachelor's degree in range management or range science is the usual minimum educational requirement for range managers. Graduate degrees in range management generally are required for teaching and research positions and may be helpful for advancement in other jobs. In 1984, about 35 colleges and universities offered degrees in range management or range science. A number of other schools offered some courses in range management. Specialized range management courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include economics, forestry, hydrology, agronomy, wildlife, animal husbandry, computer science, and recreation.

Very few colleges and universities offer degrees in soil conservation. Most soil conservationists have degrees in agronomy, agricultural education, or general agriculture; a few have degrees in related fields such as wildlife biology, forestry, and range management. Programs of study generally include 30 semester hours in natural resources or agriculture, including at least 3 hours in soils.

In addition to meeting the intellectual demands of forestry and conservation work, foresters and conservation scientists must enjoy working outdoors, be physically hardy, and be willing to move—often to remote places. They must also be able to work well with people and have good communication skills.

Recent forestry and range management graduates usually work under the supervision of experienced foresters or range managers. After gaining experience, they may advance to more responsible positions. In the Federal Government, an experienced forester may supervise an entire forest area, and may advance to regional forest supervisor or to a top administrative position. In private industry, foresters start by learning the practical and administrative aspects of the business. Many foresters work their way up to top managerial positions within their companies.

Soil conservationists usually begin working within one county or conservation district and with experience may advance to the area and State level. Also, soil conservationists can transfer to related occupations such as farm management advisors or land appraisers.

Job Outlook

Employment of foresters and conservation scientists is expected to grow more slowly than the average for all occupations through the mid-1990's. Employment should continue to grow faster in private industry than in Federal and State governments, where budget limitations are likely to restrain growth. More foresters and range managers will be needed in private industry to ensure an increasing output from forests and rangelands. Also, private owners of timberland and grazing land are likely to employ more foresters and range managers as they recognize the need for—and the higher profitability of—improved forestry, logging, and range management practices. However, the employment of soil conservationists is expected to change little through the mid-1990's since the Federal Government, the major employer, is not expected to increase its employment of soil conservationists. Most job openings for foresters and conservation scientists will be created by the need to replace those who retire or transfer to other occupations.

Earnings

Most graduates entering the Federal Government as foresters, range managers, or soil conservationists in 1985 with a bachelor's degree started at $14,400 a year, although those with high grades or a master's degree could start at $17,800. In 1984, the average Federal salary for foresters was nearly $31,000; for range conservationists, about $26,600; and for soil conservationists, about $28,100.

Related Occupations

Foresters and conservation scientists are not the only workers concerned with managing, developing, and protecting natural resources. Other workers with similar responsibilities include agricultural scientists, agricultural engineers, biological scientists, farmers, farm managers, ranchers, and wildlife managers.

Sources of Additional Information

General information about the forestry profession and lists of schools offering education in forestry are available from:

Society of American Foresters, 5400 Grosvenor Lane, Bethesda, Md. 20814.

American Forestry Association, 1319 18th St. NW., Washington, D.C. 20036.

Information about a career as a range manager as well as a list of schools offering training is available from:

Society for Range Management, 2760 W. 5th Ave., Denver, Colo. 80204.

For information about career opportunities in the Federal Government, contact:

Bureau of Land Management, U.S. Department of the Interior, Washington, D.C. 20240.

U.S. Forest Service, U.S. Department of Agriculture, P.O. Box 2417, Washington, D.C. 20013.

Soil Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, D.C. 20013.

Social Scientists, Social Workers, Religious Workers, and Lawyers

Many of the workers described in this section of the *Handbook* are concerned with the social needs of people. For example, clinical psychologists help the mentally or emotionally disturbed adjust to life through behavior modification programs and other techniques. Social workers in a wide range of settings address the needs of individuals, families, groups, and communities. Their work may involve anything from helping an elderly person adjust to life in a nursing home to organizing fundraising for community social welfare activities. Recreation workers help people enjoy their nonworking hours by organizing activities in camps, community centers, playgrounds, and other settings. Religious workers counsel people in their faith and provide spiritual and moral leadership within their communities. Lawyers advise clients of their legal rights and obligations and suggest particular courses of action in personal and business matters.

People in these types of jobs must be tactful, compassionate, and sensitive to the needs of others. Their manner must inspire trust and confidence. In fact, religious workers, lawyers, and others are bound by strict rules of ethics and may not disclose matters discussed in confidence with clients. Patience also is a vital personal characteristic as clients often are confused, hesitant, fearful, or angry. They may not fully understand their circumstances and may have difficulty expressing themselves.

Other workers described in this section conduct basic and applied research in the social sciences. They deal primarily with data and things rather than people. They use established methods to assemble a body of fact and theory that contributes to human knowledge. Social scientists investigate all aspects of human society—from an anthropologist studying the origins of the human race or a historian studying an ancient civilization to a political scientist analyzing the results of Presidential elections or a market research analyst conducting a survey of consumer preferences. Through their studies and analyses, social scientists help educators, government officials, business executives, and others to address broad social, economic, and political questions.

The ability to think logically and methodically and to analyze data is essential to social science research. Other important personal characteristics include objectivity, openmindedness, and systematic work habits. Good oral and written communication skills also are necessary.

While training and educational requirements vary among the occupations in this cluster, advanced training leading to a doctoral or equivalent professional degree is increasingly necessary for employment in certain settings, for "professional" recognition, and for advancement. Some positions for which entry was possible with a bachelor's degree now require a master's degree or suitable experience. These occupations require more training than most occupations in the *Handbook*.

The *Handbook* statements that follow include more detailed information on the nature of the work and training requirements. Information on employment, earnings, working conditions, and job outlook also is presented.

Lawyers

(D.O.T. 110)

Laws affect every aspect of our society. They regulate the entire spectrum of relationships among individuals, groups, businesses, and governments. They define rights as well as restrictions, covering such diverse activities as judging and punishing criminals, granting patents, drawing up business contracts, paying taxes, settling labor disputes, constructing buildings, and administering wills.

Because social needs and attitudes are continually changing, the legal system that regulates our social, political, and economic relationships also changes. Lawyers, also called attorneys, link the legal system and society. To perform this role, they must understand the world around them and be sensitive to the numerous aspects of society that the law touches. They must comprehend not only the words of a particular statute, but the human circumstances it addresses as well.

As our laws grow more complex, the work of lawyers takes on broader significance. Laws affect our lives in new ways as the legal system takes on regulatory tasks in areas such as transportation, energy conservation, consumer protection, the environment, and social welfare. Lawyers interpret these laws, rulings, and regulations for individuals and businesses.

Nature of the Work

In our society, lawyers act as both advocates and advisors. As advocates, they represent one of the opposing parties in criminal and civil trials by presenting arguments that support the client in a court of law. As advisors, lawyers counsel their clients as to their legal rights and obligations and suggest particular courses of action in business and personal matters.

Whether acting as advocates or advisors, nearly all attorneys have certain activities in common. Probably the most fundamental activities are the interpretation of the law and its application to a specific situation. This requires in-depth research into the purposes behind the applicable laws and into judicial decisions that have applied those laws to circumstances similar to those currently faced by the client. Based on this research, the attorney helps clients decide what actions would best serve their interests.

A growing number of lawyers are using computers in legal research. While all lawyers continue to employ law libraries to prepare cases, some supplement their search of the conventional printed sources with computer software packages that automatically search the legal literature and identify legal texts that may be relevant to a specific subject. In litigation that involves many supporting documents, lawyers may also use computers to organize and index the material. Tax lawyers are also increasingly using computers to make tax computations and explore alternative tax strategies for clients.

Lawyers must deal with people in a courteous, efficient manner and not disclose matters discussed in confidence with clients. They hold positions of great responsibility, and are obligated to adhere to strict rules of ethics.

Finally, most lawyers write reports or briefs which must communicate clearly and precisely. The more detailed aspects of a lawyer's job depend upon his or her field and position.

While all licensed attorneys are allowed to represent parties in court, some appear in court more frequently than others. A few lawyers specialize in trial work. These lawyers need an exceptional ability to think quickly and speak with ease and authority, and must be thoroughly familiar with courtroom rules and strategy. Trial lawyers still spend most of their time outside the courtroom conducting research, interviewing clients and witnesses, and handling other details in preparation for trial.

Although most lawyers deal with many different areas of the law, a significant number concentrate on one branch of law, such as admiralty, probate, or international law. Communications lawyers, for example, may represent radio and television stations in court and in their dealings with the Federal Communications Commission. They help established stations prepare and file license renewal applications, employment reports, and other documents required by the FCC on a regular basis. They also keep their clients informed of changes in FCC regulations. Communications lawyers help individuals or corporations buy or sell a station or establish a new one.

Lawyers who represent public utilities before the Federal Energy Regulatory Commission and other Federal and State regulatory agencies handle matters involving utility rates. They develop strategy, arguments, and testimony; prepare cases for presentation; and argue the case. These lawyers also inform clients about changes in regulations and give advice about the legality of their actions.

Still other lawyers advise insurance companies about the legality of insurance transactions. They write insurance policies to conform with the law and to protect companies from unwarranted claims. They review claims filed against insurance companies and represent companies in court.

Lawyers in private practice may concentrate on areas such as litigation, wills, trusts, contracts, mortgages, titles, and leases. Some manage a person's property as trustee or, as executor, see that provisions of a client's will are carried out. Others handle only public interest cases—civil or criminal—which have a potential impact extending well beyond the individual client. Attorneys hope to use these cases as a vehicle for legal and social reform.

A lawyer may be employed full time by a single client. If the client is a corporation, the lawyer is known as house counsel and usually advises a company about legal questions that arise from its business activities. These questions might involve patents, government regulations, a business contract with another company, a property interest, or a collective bargaining agreement with a union.

Attorneys employed at the various levels of government constitute still another category. Criminal lawyers may work for a State attorney general, a prosecutor or public defender, or a court. At the Federal level, attorneys may investigate cases for the Department of Justice or other agencies. Lawyers at every government level help develop laws and programs, draft and interpret legislation, establish enforcement procedures, and argue cases.

Other lawyers work for legal aid societies—private, nonprofit corporations established to serve poor people in particular areas. These lawyers generally handle civil rather than criminal cases.

A relatively small number of trained attorneys work in law schools. Most are faculty members who specialize in one or more subjects, while others serve as administrators. Some work full time in nonacademic settings and teach part time. (For additional information, see the statement on college and university faculty elsewhere in the *Handbook*.)

Working Conditions

Lawyers do most of their work in offices, law libraries, and courtrooms. They sometimes meet in clients' homes or places of business and, when necessary, in hospitals or prisons. They frequently travel to attend meetings; to gather evidence; and to appear before courts, legislative bodies, and other authorities.

Salaried lawyers in government and private corporations generally have structured work schedules. Lawyers in private practice may work irregular hours while conducting research, conferring with clients, or preparing briefs during nonoffice hours. Lawyers generally work long hours and are under particularly heavy pressure when a case is being tried. Preparation for court includes keeping abreast of the latest laws and judicial decisions.

Although work generally is not seasonal, the work of tax lawyers and other specialists may be an exception. Since lawyers in private practice can determine their own workload, many stay in practice well beyond the usual retirement age.

Employment

Lawyers held about 490,000 jobs in 1984. About four-fifths of them practiced privately, either in law firms or in solo practices. Most of the remaining lawyers held positions in government, the majority at the local level. In the Federal Government, lawyers are concentrated in the Departments of Justice, Treasury, and Defense, but they work for other Federal agencies as well. Others are employed as house counsel by public utilities, transportation firms, banks, insurance companies, real estate agencies, manufacturing firms, welfare and religious organizations, and other business firms and nonprofit organizations. Some salaried lawyers also have independent practices; others work as lawyers part time while in another occupation.

Many people trained as attorneys

Lawyers counsel clients on their legal rights and obligations and suggest courses of action.

are not employed as lawyers; they work as judges, law clerks, law school professors, and managers and administrators and in a variety of other occupations.

Training, Other Qualifications, and Advancement

To practice law in the courts of any State, a person must be licensed, or admitted to its bar, under rules established by the State's supreme court. Applicants for admission to the bar must pass a written bar examination; however, Wisconsin and West Virginia drop this requirement for graduates of their own law schools. Most States also require applicants to pass a separate written ethics examination. Lawyers who have been admitted to the bar in one State occasionally may be admitted in another State without taking an examination if they meet that State's standards of good moral character and have a specified period of legal experience. Federal courts and agencies set their own qualifications for those practicing before them.

To qualify for the bar examination in most States, an applicant must complete at least 3 years of college and graduate from a law school approved by the American Bar Association (ABA) or the proper State authorities. (ABA approval signifies that the law school—particularly its library or faculty—meets certain standards developed by the association to promote quality legal education.) In 1984, the American Bar Association approved 174 law schools. Others were approved by State authorities only. With certain exceptions, graduates of schools not approved by the ABA generally are restricted to taking the bar examination and practicing in the State in which the school is located; most of these schools are in California. Seven States accept the study of law in a law office or in combination with study in a law school; only California accepts the study of law by correspondence as qualification for taking the bar examination. Several States require registration and approval of students by the State Board of Law Examiners, either before they enter law school or during the early years of legal study.

Although there is no nationwide bar examination, 46 States and the District of Columbia require the Multistate Bar Examination (MBE) as part of the State bar examination. The MBE, covering issues of broad interest, is given in addition to a locally prepared part of the State bar examination. States vary in their treatment of MBE scores.

The required college and law school education usually takes 7 years of full-time study after high school—4 years of undergraduate study followed by 3 years in law school. Although some law schools accept a very small number of students after 3 years of college, most require applicants to have a bachelor's degree. To meet the needs of students who can attend only part time, a number of law schools have night or part-time divisions which usually require 4 years of study. In 1983, about one-eighth of all graduates of ABA-approved schools were part-time students.

Preparation for a career as a lawyer really begins in college. Although there is no recommended "prelaw" major, the choice of an undergraduate program is important. Certain courses and activities are desirable because they give the student the skills needed to succeed both in law school and in the profession. Essential skills—the ability to write, to read and analyze, to think logically, and to communicate verbally—are learned during high school and college. An undergraduate program that cultivates these skills while broadening the student's view of the world is good. Majors in the social sciences, natural sciences, and humanities all are suitable, although a student should not specialize too narrowly. Regardless of one's major, courses in English, a foreign language, public speaking, government, philosophy, history, economics, mathematics, and computer science, among others, are useful.

Students interested in a particular aspect of law may find related courses helpful; for example, engineering and science courses for the prospective patent attorney, and accounting for the future tax lawyer. In addition, typing is advisable simply for convenience in law school and beyond, and because it facilitates use of computers.

Acceptance by most law schools depends on the applicant's ability to demonstrate an aptitude for the study of law, usually through good undergraduate grades, the college admission test, and the Law School Admission Test (LSAT), administered by the Law School Admissions Service. The quality of the applicant's undergraduate school, any prior work experience, and sometimes a personal interview are also taken into consideration.

Competition for admission to many law schools is intense. Enrollments rose very rapidly during the early 1970's, with applicants far outnumbering available seats. Since then, law school enrollments have increased slowly, but applicants to many law schools still greatly exceeed the number that can be admitted. Enrollments are expected to level off during the late 1980's and early 1990's, and competition for admission to some law schools is expected to ease somewhat. However, competition for admission to the more prestigious law schools will remain stiff.

During the first year or year and a half of law school, students generally study fundamental courses such as constitutional law, contracts, property law, torts, judicial procedures, and legal writing. In the remaining time, they may elect specialized courses in fields such as tax, labor, or corporation law. Practical experience often is acquired by participation in school-sponsored legal aid or legal clinic activities, in the school's moot court competitions in which students conduct appellate arguments, in practice trials under the supervision of experienced lawyers and judges, and through research and writing on legal issues for the school's law journals.

In 1984, law students in 29 States and the District of Columbia were required to pass the Multistate Professional Responsibility Examination (MPRE), which tests their knowledge of the ABA codes on professional responsibility and judicial conduct. In some States, the MPRE may be taken during law school, usually after completing a course on legal ethics.

A number of law schools have clinical programs where students gain legal experience through practice trials and law school projects under the supervision of practicing lawyers and law school faculty. Law school clinical programs might include work in legal aid clinics, for example, or on the staff of legislative committees. Part-time or summer clerkships in law firms, government agencies, and corporate legal departments also provide experience that can be extremely valuable later on. Such training can provide references or lead directly to a job after graduation, and can help students decide what kind of practice best suits them. Clerkships also may be an important source of financial aid.

Graduates receive the degree of *juris doctor* (J.D.) or *bachelor of law* (LL.B.) as the first professional degree. Advanced law degrees are desirable for those planning to specialize, do research, or teach. Some law students pursue joint degree programs, which generally require an additional year. Joint degree programs are offered in a number of areas, including law and business administration and law and public administration.

After graduation, lawyers must keep informed about legal and nonlegal developments that affect their practice. An attorney representing electronics manufacturers, for example, must follow trade journals and the latest Federal regulations. Attorneys in the Department of State must remain well versed in current events and international law, while divorce lawyers read about the changing role of the family in modern society. Many law schools and State and local bar associations provide continuing education courses that help lawyers stay abreast of recent developments.

The practice of law involves a great deal of responsibility. Persons planning careers in law should like to work with people and be able to win the respect and confidence of their clients, associates, and the public. Integrity and honesty are vital personal qualities. Perseverance and reasoning ability are essential to analyze complex cases and reach sound conclusions. At times, lawyers need creativity when handling new and unique legal problems.

Most beginning lawyers start in salaried positions. Newly hired salaried attorneys usually act as research assistants to experienced lawyers or judges. After several years of progressively responsible salaried employment, many lawyers are admitted to partnership in their firm, or go into practice for themselves. Some lawyers, after years of practice, become judges or full-time law school faculty or administrators; a growing number have advanced degrees in other fields as well.

Some persons use their legal training in administrative or managerial positions in various departments of large corporations. A transfer from a corporation's legal department to another department often is viewed as a way to gain administrative experience and rise in the ranks of management.

Job Outlook

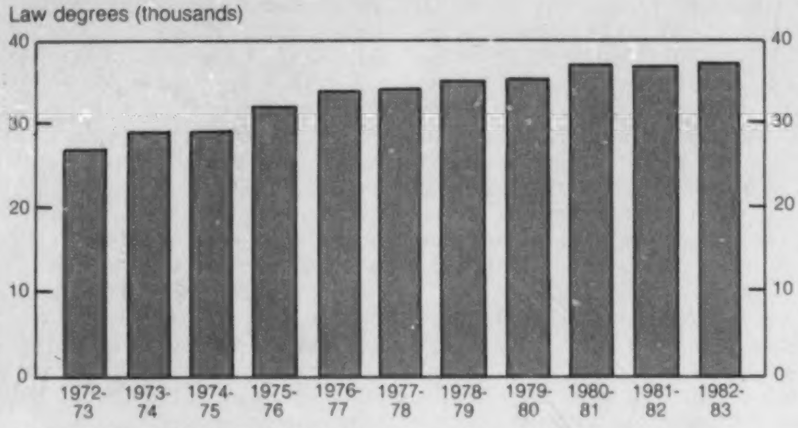
Despite strong growth in the demand for lawyers, the sizable number of law school graduates entering the job market each year has created keen competition for jobs. The number of law school graduates has more than doubled since 1970, as shown in the accompanying chart. While the number of graduates is expected to level off through the mid-1990's, competition for salaried jobs is likely to continue. New graduates, together with qualified lawyers seeking to transfer from other occupations, should continue to outnumber salaried openings, particularly in large metropolitan areas.

Employment of lawyers grew very rapidly during the last decade. Much faster-than-average growth is expected to continue through the mid-1990's as increased population and business activity help sustain the strong demand for attorneys. This demand also will be spurred by growth of legal action in such areas as consumer protection, the environment, and safety, and an anticipated increase in the use of legal services by middle-income groups through legal clinics and prepaid legal service programs. Employment growth will continue to be concentrated in private salaried jobs. The number of self-employed lawyers is expected to grow slowly as it becomes increasingly difficult to establish a profitable small practice, due to the growing complexity of law, which encourages specialization, and the cost of maintaining up-to-date legal research materials.

Turnover of jobs in this occupation is low because its members are well paid and enjoy considerable social status, and a substantial educational investment is required for entry. Nevertheless, most job openings will stem from the need to replace lawyers who transfer to other occupations, retire, or stop working for other reasons.

Employers will continue to be selective in hiring new lawyers. Graduates of prestigious law schools and those who rank high in their classes should find salaried positions with law firms, on the legal staffs of corporations and government agencies, or as law clerks for judges. Graduates of less prominent schools and those with lower scholastic ratings may experience some difficulty in finding salaried

The number of law degrees granted annually has grown slowly since the mid-1970's.



SOURCE: National Center for Education Statistics

jobs. Some graduates may be forced to accept positions for which they are overqualifed or in areas outside their field of interest. An increasing proportion will enter fields where legal training is an asset but not normally a requirement. For example, banks, insurance firms, real estate companies, government agencies, and other organizations seek law graduates to fill many administrative, managerial, and business positions.

Due to the competition for jobs, a law graduate's geographic mobility and experience assume greater importance. The willingness to relocate may be an advantage in getting a job, but to be licensed in a new State a lawyer may have to take an additional bar examination. In addition, employers increasingly seek graduates who have advanced law degrees and experience in a particular field such as tax, patent, or admiralty law.

Establishing a new practice probably will continue to be best in small towns and expanding suburban areas, as long as an active market for legal services already exists. In such communities, competition is likely to be less than in big cities, and new lawyers may find it easier to become known to potential clients; also, rent and other business costs are somewhat lower. Nevertheless, starting a new practice will remain an expensive and risky undertaking that should be weighed carefully. Most salaried positions will remain in urban areas where government agencies, law firms, and big corporations are concentrated.

Some lawyers are adversely affected by cyclical swings in the economy. During recessions, the demand for some discretionary legal services, such as planning estates, drafting wills, and handling real estate transactions, declines. Also, corporations are less likely to litigate cases when declining sales and profits result in budgetary restrictions. Although few lawyers actually lose their jobs during these times, earnings may decline for many. Some corporations and law firms will not hire new attorneys until business improves. Several factors, however, mitigate the overall impact of recessions on lawyers. During recessions, individuals and corporations face other legal problems, such as bankruptcies, foreclosures, and divorces, that require legal action. Furthermore, the continuous emergence of new laws and legal interpretations will create new opportunities for lawyers.

Earnings

In 1984, starting salaries for recent law school graduates ranged from about $10,000 a year in some public interest programs to more than $40,000 in some larger law firms. Beginning attorneys in private industry averaged nearly $29,000 in 1984. In the Federal Government, annual starting salaries for attorneys in 1985 were about $21,800 or $26,400, depending upon academic and personal qualifications. Factors affecting the salaries offered to new graduates include: Academic record; type, size, and location of employers; and the desired specialized educational background. The field of law makes a difference, too. Patent lawyers, for example, generally are among the highest paid attorneys.

Salaries of experienced attorneys also vary widely according to the type, size, and location of the employers. The average salary of the most experienced lawyers in private industry in 1984 was nearly $88,000. General attorneys in the Federal Government averaged around $44,100 a year in 1984; the relatively small number of patent attorneys in the Federal Government averaged around $53,300.

Lawyers starting their own practice may need to work part time in other occupations during the first years to supplement their income. Lawyers on salary receive increases as they assume greater responsibility. Incomes of lawyers in practice usually grow as their practices develop. Lawyers who are partners in law firms generally earn more than those who practice alone.

Related Occupations

Legal training is useful in many other occupations. Some of these are legal assistant, arbitrator, hearing examiner, journalist, patent agent, title examiner, legislative assistant, lobbyist, FBI special agent, political office holder, and corporate executive.

Sources of Additional Information

The *Prelaw Handbook*, published by Law School Admission Services, Box 2000, Newtown, Pa. 18940, provides information on prelaw study and applying to law schools. Copies may be available in public or school libraries.

Information on law schools, financial aid for law students, and law as a career is available from:

Information Services, American Bar Association, 750 North Lake Shore Dr., Chicago, Ill. 60611. (There may be a slight charge for publications.)

For information on the placement of law graduates and the legal profession in general, contact:

National Association for Law Placement, Administrative Office, 440 First St. N.W., Suite 302, Washington, D.C. 20001.

Information on legal education is available from:

Association of American Law Schools, 1 Dupont Circle NW., Suite 370, Washington, D.C. 20036.

The specific requirements for admission to the bar in a particular State may be obtained at the State capital from the clerk of the Supreme Court or the Secretary of the Board of Bar Examiners.

Social Scientists and Urban Planners

Nature of the Work

Social scientists study all aspects of human society—from the distribution of products and services to newly formed religious groups or plans for modern mass transportation systems. Social science research provides insights that help us understand the many different ways in which individuals and groups make decisions, exercise power, or respond to change. Through their studies and analyses, social scientists and urban planners assist educators, government officials, business leaders, and others to solve social, economic, and environmental problems.

Research is a basic activity for many social scientists. They use established methods to assemble a body of fact and theory that contributes to human knowledge. Applied research usually is designed to produce information that will enable people to make better decisions or manage their affairs more effectively. Interviews and surveys are widely used to collect facts, opinions, or other information. Data collection takes many other forms, however, including living and working among the people studied; archeological investigations; the analysis of historical records and documents; experiments with human subjects or lower animals in a psychological laboratory; and the administration of standardized tests and questionnaires.

Regardless of their field of specialization, social scientists are concerned with some aspect of society, culture, or personality.

Anthropologists study the way of life, remains, language, and physical characteristics of people in all parts of the world; they compare the customs, values, and social patterns of different cultures. Anthropologists generally concentrate in one of four subfields: Cultural anthropology, archeology, linguistics, or physical anthropology. Most anthropologists specialize in cultural anthropology, studying the customs, cultures, and social lives of groups in a wide range of settings from nonindustrialized societies to modern urban cultures. Archeologists study cultures from artifacts and other remains in the ground. Linguistic anthropologists study the role of language in various cultures. Physical anthropologists study the evolution of the human body and look for the earliest evidence of human life.

Economists study the way we allocate our resources to produce a wide variety of goods and services. They conduct surveys and analyze data to determine public preferences for these goods and services. Most economists are concerned with the practical applications of economic policy in a particular area, such as finance, labor, agriculture, transportation, energy, or health. Others develop theories to explain economic phenomena such as unemployment or inflation.

Geographers study the interrelationship of man and the environment. Geographers specialize, as a rule. Economic geographers deal with the geographic distribution of an area's economic activities. Political geographers are concerned with the relationship of geography to political boundaries—local, national, and international. Physical geographers study the physical characteristics of the earth. Urban geographers study cities and metropolitan areas, while regional geographers study the physical, climatic, economic, political, and cultural characteristics of a particular region or area, which may range in size from a river basin to a State, country, or continent. Cartographers design and construct maps and charts. Medical geographers study the effect of the environment on health.

Historians describe and analyze past events through writing and research. Historians usually specialize in a specific country or geographic region; in a particular time period; or in a particular field, such as social, intellectual, political, or diplomatic history. Biographers collect detailed information on individuals. Genealogists trace family histories, and other historians help preserve and protect historic buildings and sites.

Political scientists investigate the ways in which political power is gained and used. They study a wide range of subjects such as Soviet-American relations, the beliefs and institutions of nations in Asia and Africa, the politics of a New England town or a major metropolis, and the decisions of the U.S. Supreme Court. Studying topics such as public opinion, political decisionmaking, and ideology, they analyze the structure and operation of governments as well as informal political entities. Depending on the topic under study, a political scientist might conduct a public opinion survey or analyze election results.

Psychologists study human behavior and use their expertise to counsel or advise individuals or groups. Their research also assists advertisers, politicians, and others interested in influencing or motivating people. While clinical psychology is the largest specialty, psychologists specialize in many other fields such as counseling, experimental, social, or industrial psychology.

Sociologists analyze the behavior of groups or social systems such as families, neighborhoods, or clubs. Sociologists may specialize in a particular field such as criminology, rural sociology, or medical sociology.

Urban and regional planners develop comprehensive plans and programs for the use of land for industrial and public sites. Planners prepare for situations that are likely to develop as a result of population growth or social and economic change.

Working Conditions

Most social scientists have regular hours. While working alone behind a desk, they read and write research reports. Many experience the pressures of deadlines and tight schedules, and sometimes must work overtime. Their routine may be interrupted by telephone calls, letters to answer, special requests for information, meetings, or conferences. Travel may be necessary to collect information or attend meetings. Social scientists on foreign assignment must adjust to unfamiliar cultures and climates.

Some social scientists do fieldwork. For example, anthropologists and archeologists often must travel to remote areas to live among the people they study or stay for long periods at the site of their excavations.

Employment

Social scientists held about 186,000 jobs in 1984. They work for a wide range of employers including government agencies; research organizations and consulting firms; labor unions, trade associations, and nonprofit organizations; hospitals and other health facilities; and business firms.

About 1 out of 5 social scientists is self-employed and involved in counseling, consulting, research, and related activities. In addition, many persons with graduate training in a social science discipline, usually a doctoral degree, are employed by colleges and universities where they characteristically combine teaching with research and consulting. (For more information, see the *Handbook* statement on college and university faculty.) As a source of employment, the academic world is more important for graduates in sociology or political science than for graduates in urban and regional planning or psychology.

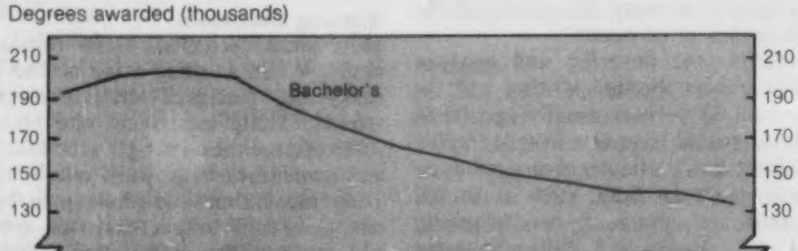
Training, Other Qualifications, and Advancement

The Ph.D. or equivalent degree is a minimum requirement for most positions in colleges and universities and is important for advancement to many top-level nonacademic posts. Graduates with master's degrees have more limited professional opportunities, although the situation varies a great deal by field. For example, job prospects for master's degree holders in urban and regional planning are brighter than for master's degree holders in sociology. Bachelor's degree holders have very limited opportunities and in most social science occupations do not qualify for "professional" positions. The bachelor's degree does, however, provide a suitable background for many different kinds of "junior professional" jobs, such as research assistant, administrative aide, or management trainee.

Training in statistics and mathematics is essential for most social scientists. Mathematical and other quantitative research methods are increasingly used in economics, geography, political science, experimental psychology, and other fields. The ability to use computers for research purposes is a "must" in many disciplines.

Depending on their jobs, social scientists and urban planners may need a wide range of personal characteristics. Because they constantly seek new information about people, things, and ideas, intellectual curiosity and creativity are two fundamental personal traits. The ability to think logically and methodically is important to a political scientist comparing the merits of various forms of government. The ability to analyze data is important to an economist studying proposals to reduce Federal budget deficits. Objectivity, openmindedness, and systematic work habits are important in all kinds of social science research. Perseverance is essential for an anthropologist, who might spend years accumulating artifacts from an ancient civilization. Emotional stability and sensitivity are vital to a clinical psychologist working with mental patients. And, of course, written and oral communication skills are essential to all these workers.

While the number of social science graduates with a bachelor's degree has declined in response to shrinking demand, the number with an advanced degree has remained stable.



SOURCE: National Center for Education Statistics

Job Outlook

Employment of social scientists is expected to grow about as fast as the average for all occupations through the mid-1990's. Most job openings, however, will result from the need to replace social scientists who transfer to other occupations, retire, or stop working for other reasons.

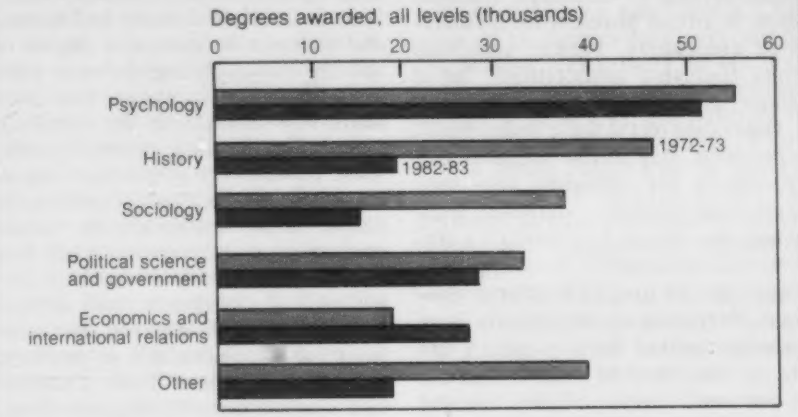
Overall, the number of degrees awarded in the social sciences is expected to exceed job openings and result in strong competition for jobs. Prospects are better in some disciplines than in others, however. The predominance of academic employment in such disciplines as anthropology, history, political science, and sociology may cause severe problems for these specialists through the mid-1990's as college enrollments decline. Compared to the past, few academic positions will be available, and efforts are continuing to acquaint new graduates in these fields with alternative or nontraditional career opportunities in areas such as program administration and evaluation. As in the past, top graduates of leading universities will have a decided advantage in competing for jobs, especially for the limited number of academic jobs. Other considerations that affect employment opportunities in these occupations include degree level; specific skills and experience; desired work setting; salary requirements; and geographic mobility.

Earnings

According to the College Placement Council, persons with a bachelor's degree in a social science field received offers averaging about $18,400 a year in 1984. Persons with a master's degree in a social science field received starting offers that averaged $19,800.

According to a 1983 National Research Council survey, the median annual salary of doctoral social scientists ranged from $34,000 to $36,000.

The number of graduates has declined in all social science fields except economics and international relations.



SOURCE: National Center for Education Statistics

In the Federal Government, social scientists with a bachelor's degree and no experience could start at $14,400 or $17,800 a year in 1985, depending on their college records. Those with a master's degree could start at $21,800, and those having a Ph.D. degree could begin at $26,400, while unusually qualified individuals could start at $31,600. The average salary of all social scientists working for the Federal Government in 1984 was about $37,700.

Related Occupations

A number of fields related to social science are covered elsewhere in the *Handbook*. See the statements on lawyers, statisticians, mathematicians, computer programmers, computer systems analysts, reporters and correspondents, social workers, religious workers, college and university faculty, and counselors.

Sources of Additional Information

For general information concerning the social sciences, contact:

Consortium of Social Science Associations, 1200 17th St. NW., Suite 520, Washington, D.C. 20036.

More detailed information about economists, psychologists, sociologists, and urban and regional planners is presented in the *Handbook* statements that follow this introductory statement.

Anthropology

For information about careers, job openings, grants and fellowships, and schools that offer training in anthropology, and for a copy of *Getting a Job Outside the Academy* (special publication no. 14), contact:

The American Anthropological Association, 1703 New Hampshire Ave. NW., Washington, D.C. 20009.

Archeology

For information about careers in archeology, contact:

Society for American Archeology, 1511 K St. NW., Suite 716, Washington, D.C. 20005.

Geography

Two pamphlets that provide information on careers and job openings for geographers—*Geography-Tomorrow's Career* and *Careers in Geography*—and the annual publication listing schools offering various programs in geography—*A Guide to Departments of Geography in the U.S. and Canada*—may be obtained from:

Association of American Geographers, 1710 16th St. NW., Washington, D.C. 20009.

Cartography and Related Fields

For information on careers in cartography, surveying, and geodesy, contact:

American Congress on Surveying and Mapping, 210 Little Falls St., Falls Church, Va. 22046.

For information on careers and a list of schools that offer courses in photogrammetry and satellite data interpretation, contact:

American Society of Photogrammetry, 210 Little Falls St., Falls Church, Va. 22046.

History

Information on careers and job openings for historians and on schools offering various programs in history is available from:

American Historical Association, 400 A St. SE., Washington, D.C. 20003.

General information on careers for historians is available from:

Organization of American Historians, 112 North Bryan St., Bloomington, Ind. 47401.

For additional information on careers for historians, send a self-addressed, stamped envelope to:

American Association for State and Local History, 708 Berry Rd., Nashville, Tenn. 37204.

Political Science

The American Political Science Association, 1527 New Hampshire Ave. NW., Washington, D.C. 20036, offers a career pamphlet for undergraduates and another—*Alternative Careers for Political Science*—for faculty and graduate students interested in pursuing nonacademic careers. Also, *A Guide to Graduate Study in Political Science* may be purchased. In addition, a monthly newsletter listing job openings, primarily academic, is available to members of the association.

Programs in Public Affairs and Administration, a biennial directory that contains data on the academic content of programs, the student body, the format of instruction, and other information, may be purchased from:

National Association of Schools of Public Affairs and Administration, 1120 G St. NW., Suite 520, Washington, D.C. 20005.

Economists

(D.O.T. 050.067)

Nature of the Work

Economists study the way a society uses scarce resources such as land, labor, raw materials, and machinery to provide goods and services. They analyze the results of their research to determine the costs and benefits of making, distributing, and using resources in a particular way. Their research might focus on topics such as energy costs, farm prices, or commodity imports.

Some economists who are primarily theoreticians may develop theories through the use of mathematical models to explain the causes of business cycles and inflation or the effects of unemployment and tax policy. Most economists, however, are concerned with practical applications of economic policy in a particular area, such as finance, labor, agriculture, transportation, energy, or health. They use their understanding of economic relationships to advise business firms, insurance companies, banks, securities firms, industry associations, labor unions, government, and others.

Depending on the topic under study, economists may devise methods and procedures for obtaining data they need. For example, sampling techniques may be used to conduct a survey, and econometric modeling techniques may be used to develop projections. Preparing reports usually is an important part of the economist's job. He or she may be called upon to review and analyze all the relevant data, prepare tables and charts, and write up the results in clear, concise language.

Being able to present economic and statistical concepts in a meaningful way is particularly important for economists whose research is policy directed. Market research analysts who work for business firms may be asked to provide management with information to make decisions on marketing and pricing of company products; to look at the advisability of adding new lines of merchandise, opening new branches, or diversifying the company's operations; to analyze the effect of changes in the tax laws; or to prepare economic and business forecasts. Business economists working for firms that carry on operations abroad may be asked to prepare forecasts of foreign economic conditions.

Some economists study the interrelationships of the Nation's business firms.

Economists who work for government agencies assess economic conditions in the United States and abroad and estimate the economic impact of specific changes in legislation or public policy. For example, they may study how changes in the minimum wage affect teenage unemployment. Most government economists are in the fields of agriculture, business, finance, labor, transportation, urban economics, or international trade. For example, economists in the U.S. Department of Commerce study domestic production, distribution, and consumption of commodities or services; those in the Federal Trade Commission prepare industry analyses to assist in enforcing Federal statutes designed to eliminate unfair, deceptive, or monopolistic practices in interstate commerce; and those in the Bureau of Labor Statistics analyze data on prices, wages, employment, and productivity.

Working Conditions

Economists working for government agencies and private firms have structured work schedules. They may work alone with only reports, statistical charts, computers, and calculators for company. Or they may be an integral part of a research team. Most work under pressure of deadlines, tight schedules, and heavy workloads, and sometimes must work overtime. Their routine may be interrupted by special requests for data, letters, meetings, or conferences. Travel may be necessary to collect data or attend conferences.

Economics faculty have flexible work schedules, dividing their time among teaching, research, consulting, and administrative responsibilities.

Employment

Economists held about 38,000 jobs in 1984. Private industry—particularly economic and market research firms, management consulting firms, securities and investment companies, advertising firms, and utilities—employed over three-fifths of all economists. The remainder were employed by a wide range of government agencies, primarily in the Federal Government. The Departments of Agriculture, Labor, and State are the largest Federal employers. Some economists run their own consulting businesses. A number of economists combine a full-time job in government or business with part-time or consulting work in another setting.

Employment of economists is concentrated in large cities. The largest numbers are in New York City and Washington, D.C. Some work abroad for companies with major international operations; for the Department of State and other U.S. Government agencies; and for international organizations.

Besides the jobs described above, an estimated 22,000 persons held economics and marketing faculty positions in colleges and universities. (For information about this occupation, see the statement on college and university faculty elsewhere in the *Handbook.*)

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in economics or marketing is sufficient for many beginning research, administrative, management trainee, and sales jobs. The undergraduate curriculum includes courses such as: Microeconomics; macroeconomics; business cycles; economic and business history; economic development of selected areas; money and banking; international economics; public finance; industrial organization; labor economics; comparative economic systems; economics of national planning; urban economic problems; marketing; consumer analysis; psychology; sociology; organizational behavior; and business law. In addition, courses in mathematics, business and economic statistics, sampling theory and survey design, and computer science are highly recommended.

Graduate training increasingly is required for most economist jobs and for advancement to more responsible positions. Areas of specialization at the graduate level include advanced economic theory, mathematical economics, econometrics, economic statistics, history of economic thought, and comparative economic systems and planning. Other areas include economic history, economic development, environmental and natural resource economics, industrial organization, marketing, institutional economics, international economics, labor economics, monetary economics, public finance, regional and urban economics, and social policy. Students should select graduate schools strong in specialties in which they are interested. Some schools help graduate students find internships or part-time employment in government agencies, economic consulting firms, or market research firms. Work experience and contacts can be useful in testing career preferences and learning about the job market for economists.

In the Federal Government, candidates for entrance positions generally need a college degree with a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus. However, because competition is keen, additional education or experience may be required.

For a job as a college instructor in many junior colleges and small 4-year schools, a master's degree generally is the minimum requirement. In some colleges and universities, however, a Ph.D. is necessary for appointment as an instructor. The Ph.D. and extensive publication are required for a professorship and for tenure, which are increasingly difficult to obtain.

In government, industry, research organizations, and consulting firms, economists who have a graduate degree usually can qualify for more responsible research and administrative positions. A Ph.D. is necessary for top positions in many organizations. Many corporation and government executives have strong backgrounds in economics or marketing.

Over 1,200 colleges and universities offer bachelor's degree programs in economics and marketing; over 600, master's; and about 130, doctoral programs.

Persons considering careers as economists should be able to work accurately with detail since much time is spent on data analysis. Patience and persistence are necessary because economists may spend long hours on independent study and problem solving. At the same time, they must be able to work well with others. Economists must be objective and systematic in their work and be able to express themselves effectively both orally and in writing. Creativity and intellectual curiosity are essential for success in this field, just as they are in other areas of scientific endeavor.

Job Outlook

Employment of economists is expected to grow about as fast as the average for all occupations through the mid-1990's. Most job openings will result from the need to replace experienced economists who transfer to other occupations, retire, or leave the labor force for other reasons.

Overall, economists are likely to have more favorable job prospects than most other social scientists. Opportunities should be best in manufacturing, financial services, advertising agencies, research organizations, and consulting firms, reflecting the complexity of the domestic and international economies and increased reliance on quantitative methods of analyzing business trends, forecasting sales, and planning of purchasing and production. The continued need for economic analyses by lawyers, accountants, engineers, health service administrators, urban and regional planners, environmental scientists, and others will also increase the number of jobs for economists. Little change is expected in the employment of economists in the Federal Government—in line with the rate of growth projected for the Federal work force as a whole. Average growth is expected in the employment of economists in State and local government. While courses in economics are increasingly popular, college enrollments are expected to decline through the mid-1990's—resulting in little or no employment growth in colleges and universities. As a result, many highly qualified economics graduates will enter nonacademic positions.

A strong background in economic theory, statistics, and econometrics provides the tools for acquiring any specialty within the field. Those skilled in quantitative techniques and their application to economic modeling and forecasting and market research, including the use of computers, should have the best job opportunities.

Persons who graduate with a bachelor's degree in economics through the mid-1990's should face very keen competition for the limited number of economist positions for which they qualify. However, many will find employment in government, industry, and business as management or sales trainees, or as research or administrative assistants. Those with strong backgrounds in mathematics, statistics, survey design, and computer science may be hired by private firms for market research work. Those who meet State certification requirements may become high school economics teachers. (For additional information, see the statement on secondary school teachers elsewhere in the *Handbook*.)

Candidates who hold master's degrees in economics face very strong competition, particularly for teaching positions in colleges and universities. However, some may gain positions in junior and community colleges. Those with a strong background in marketing and finance may have the best prospects in business, banking, advertising, and management consulting firms.

Ph.D.'s are likely to face competition for academic positions, although top graduates from leading universities should have little difficulty in acquiring teaching jobs. However, a larger number of Ph.D.'s will have to accept jobs at smaller or less prestigious institutions. Ph.D.'s should have favorable opportunities to work as economists in government, industry, educational and research organizations, and consulting firms.

Earnings

According to a 1984 salary survey by the College Placement Council, persons with a bachelor's degree in economics received an average starting salary of about $20,000 a year; in marketing and distribution, about $17,800.

Median annual earnings of full-time economists were about $29,000 in 1984. The middle 50 percent earned between $24,300 and $41,700 annually. The lowest 10 percent earned under $16,100, while the highest 10 percent earned over $52,000.

The median base salary of business economists in 1984 was $50,000, according to a survey by the National Association of Business Economists. About one-third of those responding also had income from secondary employment. Economists in general administration and international economics commanded the highest salaries; those in market research and econometrics, the lowest. The highest paid business economists were in the mining, retail and wholesale trade, and securities and investment industries; the lowest paid were in the education, transportation, and publishing industries.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the entrance salary for economists having a bachelor's degree averaged about $14,400 a year in 1985; however, those with superior academic records could begin at about $17,800. Those having a master's degree could qualify for positions at an annual salary of about $21,800. Those with a Ph.D. could begin at about $26,400, while unusually qualified individuals could start at $31,600. Economists in the Federal Government averaged around $39,500 a year in 1984.

Related Occupations

Economists are concerned with understanding and interpreting financial matters, among other subjects. Others with jobs in this area include financial analysts, bank officers, accountants and auditors, underwriters, actuaries, securities sales workers, credit analysts, loan officers, and budget officers.

Sources of Additional Information

For information on schools offering graduate training in economics, contact:

American Economic Association, 1313 21st Ave. South, Nashville, Tenn. 37212.

For information on careers in business economics, contact:

National Association of Business Economists, 28349 Chagrin Blvd., Suite 201, Cleveland, Ohio 44122.

For information about careers and salaries in market research, contact:

American Marketing Association, 250 South Wacker Dr., Chicago, Ill. 60606.

For information about careers in noncollegiate academic institutions, contact:

Joint Council on Economic Education, 2 Park Ave., New York, N.Y. 10016.

Psychologists

(D.O.T. 045.061, .067, .107-022, -026, -030, -034, and -046)

Nature of the Work

Psychologists study human behavior and mental processes to understand and explain people's actions. Some research psychologists investigate the physical, emotional, or social aspects of human behavior. Other psychologists in applied fields counsel and conduct training programs; do market research; or provide health services in hospitals or clinics.

Like other social scientists, psychologists collect and test the validity of data and formulate hypotheses. Research methods depend on the topic under study. Psychologists may gather information through controlled laboratory experiments; performance, aptitude, and intelligence tests; observation, interviews, and questionnaires; clinical studies; or surveys. Computers are widely used to record and analyze this information.

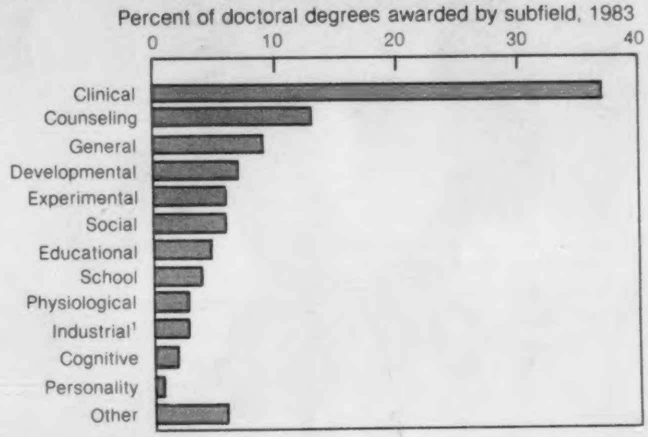
Psychologists usually specialize. *Experimental psychologists* study behavior processes and work with human beings and lower animals such as rats, monkeys, and pigeons; prominent areas of experimental research include motivation, learning and retention, sensory and perceptual processes, and genetic and neurological factors in behavior. *Developmental psychologists* study the patterns and causes of behavioral change as people progress through life; some concern themselves with behavior during infancy and childhood, while others study changes that take place during maturity and old age. *Personality psychologists* study human nature, individual differences, and the ways in which those differences develop. *Social psychologists* examine people's interactions with others and with the social environment; prominent areas of study include group behavior, leadership, attitudes, and interpersonal perception. *Comparative psychologists* study the behavior of humans and lower animals. *Physiological psychologists* study the relationship of behavior to the biological functions of the body. Psychologists in the field of *psychometrics* develop and apply procedures for measuring psychological variables such as intelligence and personality.

Clinical psychologists generally work in hospitals or clinics, or maintain their own practices. They help the mentally or emotionally disturbed adjust to life. They interview patients; give diagnostic tests; provide individual, family, and group psychotherapy; and design and carry through behavior modification programs. Clinical psychologists may collaborate with physicians and other specialists in developing treatment programs. Some clinical psychologists work in universities where they train graduate students in the delivery of mental health services. Others administer community mental health programs. *Counseling psychologists* use several techniques, including interviewing and testing, to advise people on how to deal with problems of everyday living—personal, social, educational, or vocational. *Educational psychologists* design, develop, and evaluate educational programs. *School psychologists* work with teachers and parents to evaluate and resolve students' learning and behavior problems. *Industrial and organizational psychologists* apply psychological techniques to personnel administration, management, and marketing problems. They are involved in policy planning, training and development, psychological test research, counseling, and organizational development and analysis, among other activities. For example, an industrial psychologist may work with management to develop better training programs and to reorganize the work setting to improve worker productivity. *Engineering psychologists*, often employed in factories and plants, develop and improve human/machine systems, military equipment, and industrial products. *Community psychologists* apply psychological knowledge to problems of urban and rural life. *Consumer psychologists* study the psychological factors that determine an individual's behavior as a consumer of goods and services. *Health psychologists* counsel the public in health maintenance to help people avoid serious emotional or physical illness. Other areas of specialization include environmental psychology, population psychology, psychology and the arts, history of psychology, psychopharmacology, and military and rehabilitation psychology.

Working Conditions

A psychologist's specialty and place of employment determine his or her working conditions. For example, clinical and counseling psychologists in private practice have pleasant, comfortable offices and set their own hours. However, they often have evening hours to accommodate their clients. Some employed in hospitals, nursing homes, and other health facilities often work evenings and weekends, while others in schools and clinics work regular hours. Psychologists employed by academic institutions divide their time among teaching, research, and administrative responsibilities. Some maintain part-time clinical practices as well. In contrast to the many psychologists who have flexible work schedules, some in gov-

Clinical psychology accounts for over one-third of all doctoral degrees awarded in psychology.



[1] Includes organizational psychology.
SOURCE: National Research Council

ernment and private industry have more structured schedules. Reading and writing research reports, they often work alone behind a desk. Many experience the pressures of deadlines, tight schedules, heavy workloads, and overtime work. Their routine may be interrupted frequently. Travel may be required to attend conferences or conduct research.

Employment

Psychologists held about 97,000 jobs in 1984. Educational institutions—primarily elementary and secondary schools—employed about 40 percent of all salaried psychologists in positions involving counseling, testing, special education, research, and administration. Hospitals, clinics, rehabilitation centers, nursing homes, and other health facilities employed more than 1 out of 4 psychologists; government agencies at the Federal, State, and local levels, about 1 out of 6. The Veterans Administration, the Department of Defense, and the Public Health Service employ more psychologists than other Federal agencies. They also are employed by social service organizations, research organizations, management consulting firms, market research firms, and other businesses.

After several years of experience, some psychologists enter private practice or set up their own research or consulting firms. More than one-fourth of all psychologists are self-employed.

Besides the jobs described above, an estimated 19,000 persons held psychology faculty positions at colleges and universities. (For information about this occupation, see the statement on college and university faculty elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

A doctoral degree is often required for employment as a psychologist, particularly in the academic world. Understandably, entrants to this occupation are older, on average, than entrants to other professional occupations. People with doctorates in psychology (Ph.D or Psy.D.—Doctor of Psychology) qualify for a wide range of responsible research, clinical, and counseling positions in universities, private industry, and government.

People with a master's degree in psychology can administer and interpret tests as psychological assistants. Under the supervision of psychologists, they can conduct research in laboratories, counsel patients, or perform administrative duties. They may teach in 2-year colleges, or work as school psychologists or counselors. (See the *Handbook* statement on counselors.)

People with a bachelor's degree in psychology are qualified to assist psychologists and other professionals in community mental health centers, vocational rehabilitation offices, and correctional programs; to work as research or administrative assistants; and to take jobs as trainees in government or business. However, without additional academic training, their advancement opportunities are limited.

In the Federal Government, candidates having at least 24 semester hours in psychology and one course in statistics qualify for entry level positions. Competition for these jobs is keen, however. Clinical psychologists generally must have completed the Ph.D. or Psy.D. requirements and have served an internship; vocational and guidance counselors usually need 2 years of graduate study in counseling and 1 year of counseling experience.

At least 1 year of full-time graduate study is needed to earn a master's degree in psychology. Requirements usually include practical experience in an applied setting or a master's thesis based on a research project. For example, a master's degree in school psychology requires 2 years of course work and a 1-year internship.

Three to five years of graduate work usually are required for a doctoral degree. The Ph.D. degree culminates in a dissertation based on original research. Courses in quantitative research methods, which include the use of computers, are an integral part of graduate study and usually necessary to complete the dissertation. The Psy.D., based on practical work and examinations rather than a dissertation, prepares students for clinical and other applied positions. In clinical or counseling psychology, the requirements for the doctoral degree generally include an additional year or more of internship or supervised experience.

Competition for admission into graduate programs is keen. Some universities require an undergraduate major in psychology. Others prefer only basic psychology with courses in the biological, physical, and social sciences, statistics, and mathematics.

Over 1,500 colleges and universities offer a bachelor's degree program in psychology; about 400, a master's; about 300, a Ph.D. In addition, about 30 professional schools of psychology—some affiliated with colleges or universities—offer the Psy.D. The American Psychological Association (APA) presently accredits Ph.D. training programs in clinical, counseling, and school psychology as well as Psy.D. programs. In 1984, 123 colleges and universities offered fully approved programs in clinical psycholo-

People pursuing a career in psychology must be emotionally stable, mature, and able to deal effectively with people.

gy (including 7 Psy.D. programs); 32 in counseling psychology; and 22 in school psychology (including 1 Psy.D. program). APA also has accredited about 275 institutions that provide internships for doctoral students in clinical and counseling psychology.

Although financial aid is becoming increasingly difficult to obtain, some universities award fellowships or scholarships, or arrange for part-time employment. The Veterans Administration (VA) offers predoctoral traineeships to interns in VA hospitals, clinics, and related training agencies. The National Science Foundation, the Department of Health and Human Services, the Armed Forces, and many other organizations also provide financial aid.

Psychologists who want to enter independent practice must meet certification or licensing requirements. In 1984, all States and the District of Columbia had such requirements. Licensing laws vary by State, but generally require a doctorate in psychology and 2 years of professional experience. In addition, most States require that applicants pass an examination. Most State boards administer a standardized test. Some States certify those with master's level training as psychological assistants or associates. Some States require continuing education for relicensure.

Most States require that licensed or certified psychologists limit their practice to those areas in which they have developed professional competence through training and experience.

The American Board of Professional Psychology recognizes professional achievement by awarding diplomas primarily in clinical, counseling, forensic, industrial and organizational, and school psychology. Candidates need a doctorate in psychology, 5 years of experience, and professional endorsements; they also must pass an examination.

People pursuing a career in psychology must be emotionally stable, mature, and able to deal effectively with people. Sensitivity, compassion, and the ability to lead and inspire others are particularly important for clinical work and counseling. Research psychologists should be able to do detailed work independently and as part of a team. Verbal and writing skills are necessary to communicate research findings. Patience and perseverance are vital qualities because results from psychological treatment of patients or research often are long in coming.

Job Outlook

Employment of psychologists is expected to increase faster than the average for all occupations through the mid-1990's. Largely because of the substantial investment in training required to enter this specialized field, psychologists have a strong attachment to their occupation—only a relatively small proportion leave the profession each year. Nevertheless, most job openings are expected to result from replacement needs.

Several factors may help maintain the demand for psychologists: Increased emphasis on health maintenance rather than treatment of illness; public concern for the development of human resources, including the growing elderly population; and increased testing and counseling of children. Government funding of these services could affect the demand for psychologists.

Some openings are likely to occur as psychologists study the effectiveness of health, education, military, law enforcement, and consumer protection programs. Psychologists also are increasingly studying the effects on people of technological advances in areas such as agriculture, energy, the environment, and the conservation and use of natural resources.

Because college enrollments are expected to decline through the mid-1990's, little or no employment growth is expected in colleges and universities. As a result, there will be keen competition for academic positions. Although outstanding Ph.D. holders from leading universities should have no difficulty in obtaining teaching jobs at top schools, a larger number of Ph.D.'s will be forced to take jobs at smaller, less prestigious institutions. Some may accept part-time or temporary assignments with little or no hope of gaining tenure. As a result, many highly qualified graduates are expected to seek nonacademic jobs.

Persons holding doctorates from leading universities in applied areas such as clinical, counseling, health, and engineering psychology should have particularly good prospects. Psychologists with extensive training in quantitative research methods and computer science will have a competitive edge over applicants without this background.

Persons with only a master's degree in psychology will probably continue to encounter severe competition for the limited number of jobs for which they qualify. Nevertheless, some may find jobs as counselors in schools or as psychological assistants in community mental health centers.

Bachelor's degree holders can expect very few opportunities in this field. Some may find jobs as assistants in rehabilitation centers. Those who meet State certification requirements may become high school psychology teachers. (For more information, see the statement on secondary school teachers elsewhere in the *Handbook*.)

Earnings

According to a 1983 survey by the National Research Council, the median annual salary of psychologists with a doctoral degree was about $35,800. In educational institutions, the median was about $33,600; in State and local government, about $32,300; in hospitals and clinics, about $32,700; in other nonprofit organizations, about $29,800; and in business and industry, about $48,000. Ph.D. or Psy.D. psychologists in private practice and in applied specialties generally have higher earnings than other psychologists.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the average starting salary for psychologists having a bachelor's degree was about $14,400 a year in 1985; those with superior academic records could begin at $17,800. Counseling psychologists with a master's degree and 1 year of counseling experience could start at $21,800. Clinical psychologists having a Ph.D. or Psy.D. degree and 1 year of internship could start at $26,400; unusually qualified individuals could start at $31,600. The average salary for psychologists in the Federal Government was about $39,800 a year in 1984.

Related Occupations

Psychologists are trained to evaluate, counsel, and advise individuals and groups. Others who do this kind of work are psychiatrists, social workers, clergy, special education teachers, and counselors.

Sources of Additional Information

For information on careers, educational requirements, licensing, and financial assistance, contact:

American Psychological Association, Educational Affairs Office, 1200 17th St. NW., Washington, D.C. 20036.

For information about a career as a school psychologist, contact:

National Association of School Psychologists, 10 Overland Dr., Stratford, Conn. 06497.

Information about State licensing requirements is available from:

The American Association of State Psychology Boards, P.O. Box 4389, Montgomery, Ala. 36103.

Information on traineeships and fellowships also is available from colleges and universities that have graduate departments of psychology.

Sociologists

(D.O.T. 054)

Nature of the Work

Sociologists study human society and social behavior by examining the groups and social institutions that people form. These include families, tribes, communities, and governments, as well as a variety of social, religious, political, business, and other organizations. Sociologists study the behavior and interaction of groups, trace their origin and growth, and analyze the influence of group activities on individual members. Some sociologists are concerned primarily with the characteristics of social groups and institutions. Others are more interested in the ways individuals are affected by the groups to which they belong.

Fields of specialization for sociologists include social organization, social stratification and mobility, racial and ethnic relations, social psychology, urban sociology, rural sociology, political sociology, industrial sociology, applied sociology, and evaluation research. Other important specialties include medical sociology—the study of social factors that affect mental and public health; demography—the study of the size, characteristics, and movement of populations; gerontology—the study of aging and the special problems of aged persons; environmental sociology—the study of the effect of the physical environment and technology on people; clinical sociology—intervention in social systems for assessment and change; and criminology—the study of factors producing deviance from accepted legal and cultural norms.

Sociological research, like other kinds of social science research, involves collecting information, assessing its validity, and analyzing the results. Sociologists usually conduct surveys or engage in direct observation to gather the data they need. For example, after providing for controlled conditions, a sociologist might test the effects of different styles of leadership on individuals in a small group. A medical sociologist might study the incidence of lung cancer in an area contaminated by industrial pollutants. Sociological researchers also evaluate the efficacy of different kinds of social programs. They might examine and evaluate particular programs of income assistance, job training, or remedial education. Increasingly, sociologists apply statistical and computer techniques in their research. The results of sociological research aid educators, lawmakers, administrators, and others interested in social problems and social policy. Sociologists often work closely with community groups and members of other professions including psychologists, physicians, economists, urban and regional planners, political scientists, anthropologists, law enforcement officials, and social workers.

Some sociologists are primarily administrators. They apply their professional knowledge in areas as diverse as intergroup relations, family counseling, public opinion analysis, law enforcement, education, personnel administration, public relations, regional and community planning, and health services planning. They may, for example, administer social service programs in family and child welfare agencies or develop social policies and programs for government, community, youth, or religious organizations.

A number of sociologists are employed as consultants. Using their expertise and research skills, they advise on such diverse problems as halfway houses and foster care for the mentally ill; ways of counseling ex-offenders; and market research for advertisers and manufacturers. Increasingly, sociologists are involved in the evaluation of social and welfare programs.

Working Conditions

Most sociologists do a lot of desk work—reading and writing reports on their research. Sociologists working in government agencies and private firms have structured work schedules, and many experience the pressures of

Sociologists assess the effects of population movements.

deadlines, tight schedules, heavy workloads, and overtime. Their routine may be interrupted by numerous telephone calls, letters, requests for information, and meetings. Travel may be required to collect data for research projects or to attend professional conferences. Sociologists in private practice may work evenings and weekends to accommodate clients.

Sociology faculty have flexible work schedules, dividing their time between teaching, research, consulting, and administrative responsibilities.

Employment

Sociologists held about 5,600 jobs in 1984. Government agencies employ about 4 out of 10 sociologists to deal with such subjects as poverty, crime, public assistance, population policy, social rehabilitation, community development, mental health, racial and ethnic relations, and environmental impact studies. Sociologists in the Federal Government work primarily for the Departments of Health and Human Services, Interior, Agriculture, and Defense. Sociologists specializing in demography work for international organizations such as the World Bank, the United Nations, and the World Health Organization and Federal agencies such as the Bureau of the Census. Sociologists also hold managerial, research, and planning positions in research firms, consulting firms, educational institutions, corporations, professional and trade associations, hospitals, and welfare or other nonprofit organizations. Some sociologists have private practices in counseling, research, or consulting.

Besides the jobs described above, about 13,000 persons held sociology faculty positions in colleges and universities. (For more information about this occupation, see the statement on college and university faculty elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

The Ph.D. degree is required for appointment to permanent teaching and research positions in colleges and universities and is essential for many senior level positions in research institutes, consulting firms, corporations, and government agencies. As the academic job market gets tighter through the mid-1990's, a Ph.D. will be increasingly required for virtually all academic and professional sociologist positions.

Sociologists with master's degrees can qualify for administrative and research positions in public agencies and private businesses. Training in research, statistical, and computer methods is an advantage in obtaining such positions. Advancement opportunities generally are more limited for master's degree holders than for Ph.D.'s. Sociologists with master's degrees may qualify for teaching positions in junior colleges and for some college instructorships.

Most bachelor's degree holders in sociology get jobs in related fields. Many work as social workers, counselors, or recreation workers in public and private welfare agencies. Others are employed as interviewers or as administrative or research assistants. Sociology majors with sufficient training in statistical and survey methods may qualify for positions as junior analysts or statisticians in business or research firms or government agencies.

In the Federal Government, candidates generally need a college degree with 24 semester hours in sociology, including course work in theory and methods of social research. However, since competition for the limited number of positions is keen, advanced study in the field is highly recommended.

About 150 colleges and universities offer doctoral degree programs in sociology; most of these also offer a master's degree. In 170 schools, the master's is the highest degree offered, and about 900 schools have bachelor's degree programs. Sociology departments offer a wide variety of courses including sociological theory, field methods, social statistics and quantitative methods, crime and deviance, social psychology, sex roles, population, social stratification, social control, small group analysis, urban sociology, rural sociology, social organizations, and sociology of religion, law, the arts, war, politics, education, work and occupations, and mental health.

Some departments of sociology have highly structured programs, while others are relatively unstructured and leave most course selection up to individual students. Departments have different requirements regarding foreign language skills, courses in statistics, internships, and completion of a thesis for the master's degree.

The choice of a graduate school is important for people who want to become sociologists. Students should select a school that has adequate research facilities and offers appropriate areas of specialization such as theory, demography, clinical sociology, or quantitative methods. Opportunities to gain practical experience also may be available, and sociology departments may help place students in business or research firms and government agencies.

Certification by the Clinical Sociology Association (CSA) is necessary for a small number of clinical sociology positions. Certification requirements generally include at least 1 year of experience that demonstrates competence in clinical sociology, a doctorate from an accredited school, and successful demonstration of competency at CSA-sponsored training workshops or conferences.

The ability to work independently is important for sociologists. Intellectual curiosity is an essential trait; researchers must have inquiring minds and a desire to find explanations for the phenomena they observe. Like other social scientists, sociologists must be objective in gathering information about social institutions and behavior; they need analytical skills in order to organize data effectively and reach valid conclusions; and they must be careful and systematic in their work. Because communicating their findings to other people is an important part of the job, sociologists must be able to speak well and to write clearly and concisely.

Job Outlook

Employment of sociologists is expected to increase more slowly than the average for all occupations through the mid-1990's. Most openings are expected to result from the need to replace sociologists who transfer to other occupations, retire, or leave the labor force for other reasons. Some increased demand for sociologists is likely to arise from demographic research and the need to evaluate and administer programs designed to cope with social and welfare problems.

The number of persons who graduate with advanced degrees in sociology through the mid-1990's is likely to greatly exceed the available job openings. Graduates with a Ph.D. will face increasingly keen competition for academic positions, and those with degrees from the most outstanding institutions will have an advantage in securing teaching jobs.

An increasing proportion of Ph.D.'s will enter nonacademic careers. Some may take research and administrative positions in government, research organizations, and business firms. Those well trained in quantitative research methods, including survey techniques, advanced statistics, and computer science, will have the widest choice of jobs. For example, private firms that contract with the government to evaluate social programs and conduct other research increasingly seek sociologists with strong quantitative skills. Demand is expected to be strong for those with training in practice areas such as clinical sociology, criminology, environmental sociology, medical sociology, social gerontology, and demography. For example, additional demographers may be sought to help businesses plan marketing and advertising programs and to help developing countries analyze censuses, prepare population projections, and formulate long-range public planning programs. More gerontologists may be needed to help formulate programs for our expanding elderly population. Sociologists with training in other applied disciplines, such as public policy, public administration, and business administration, will be attractive to employers seeking managerial and administrative personnel.

Persons with a master's degree will find few, if any, academic positions, even in junior and community colleges. They also will face strong competition for the nonacademic positions open to them. Some may find research and administrative jobs in research firms, business, and government. For example, sociologists with backgrounds in business and quantitative research methods may find opportunities in market research firms.

Bachelor's degree holders will find few opportunities for jobs as professional sociologists. As in the past, many graduates will take positions as trainees and assistants in business, industry, and government. As with advanced degree holders, extensive training in quantitative research methods provides these graduates with the most marketable skills. Some may find positions in social welfare agencies. For those planning careers in law, journalism, business, social work, recreation, counseling, and other related disciplines, sociology provides an excellent background. Those who meet State certification requirements may become high school sociology teachers. (For more information, see the statement on secondary school teachers elsewhere in the *Handbook*.)

Earnings

According to a 1983 survey by the National Research Council, the median annual salary of sociologists and anthropologists combined was $32,100. For those in educational institutions, it was $31,800, and in business and industry, $36,300.

The Federal Government recognizes education and experience in certifying applicants for entry level positions. In general, the average entrance salary for sociologists with a bachelor's degree was about $14,400 or $17,800 a year in 1985, depending upon the applicant's academic record. The starting salary for those with a master's degree was about $21,800 a year, and for those with a Ph.D., about $26,400, while unusually qualified individuals could start at $31,600. Sociologists in the Federal Government averaged around $38,700 a year in 1984.

In general, sociologists with the Ph.D. degree earn substantially higher salaries than those without the doctoral degree. Some sociologists supplement their regular salaries with earnings from other sources, such as consulting or counseling work.

Related Occupations

Sociologists are not the only people whose jobs require an understanding of social processes and institutions. Others whose work demands such expertise include anthropologists, economists, geographers, historians, political scientists, psychologists, urban and regional planners, reporters and correspondents, and social workers.

Sources of Additional Information

Additional information on careers, and graduate departments of sociology is available from:

The American Sociological Association, 1722 N St. NW., Washington, D.C. 20036.

For information about careers in demography, contact:

Population Association of America, 806 15th St NW., Suite 640, Washington, D.C. 20005.

For information about careers in clinical sociology, contact:

Clinical Sociology Association, RD2, Box 141A, Chester, N.Y. 10918.

For information about careers in rural sociology, contact:

Rural Sociology Society, Department of Sociology, Montana State University, Bozeman, Mont. 59717.

For information about careers in criminology, contact:

American Society of Criminology, 1314 Kinnear Road, Suite 212, Columbus, Ohio 43212.

Urban and Regional Planners

(D.O.T. 188.167-110 and 199.167-014)

Nature of the Work

Urban and regional planners, often called community or city planners, develop programs to provide for future growth and revitalization of urban, suburban, and rural communities and their regions. They help local officials make decisions on social, economic, and environmental problems.

Planners examine community facilities such as health clinics and schools to be sure these facilities can meet the demands placed upon them. They also keep abreast of the legal issues involved in community development or redevelopment and changes in housing and building codes. Because suburban growth has increased the need for better ways of traveling to the urban center, the planner's job often includes designing new transportation systems and parking facilities.

Urban and regional planners prepare for situations that are likely to develop as a result of population growth or social and economic change. They estimate, for example, the community's long-range needs for housing, transportation, and business and industrial sites. Working within a framework set by the community government, they analyze and propose alternative ways to achieve more efficient and attractive urban areas.

Before preparing plans for long-range community development, urban and regional planners prepare detailed studies that show the current use of land for residential, business, and community purposes. These reports include such information as the location of streets, highways, water and sewer lines, schools, libraries, and recreational sites. They also provide information on the types of industries in the community, characteristics of the population, and employment and economic trends. With this information, urban and regional planners propose ways of using undeveloped land and design the layout of recommended buildings and other facilities such as subway stations. They also prepare materials that show how their programs can be carried out and what they will cost. As in many other fields, planners increasingly use computers to record and analyze information.

Urban and regional planners often confer with land developers, civic leaders, and other public planning officials. They may prepare materials for community relations programs, speak at civic meetings, and appear before legislative committees to explain their proposals.

In large organizations, planners usually specialize in areas such as physical design, public transportation, community relations, and the renovation or reconstruction of rundown business districts. In small organizations, planners must be able to do several kinds of work.

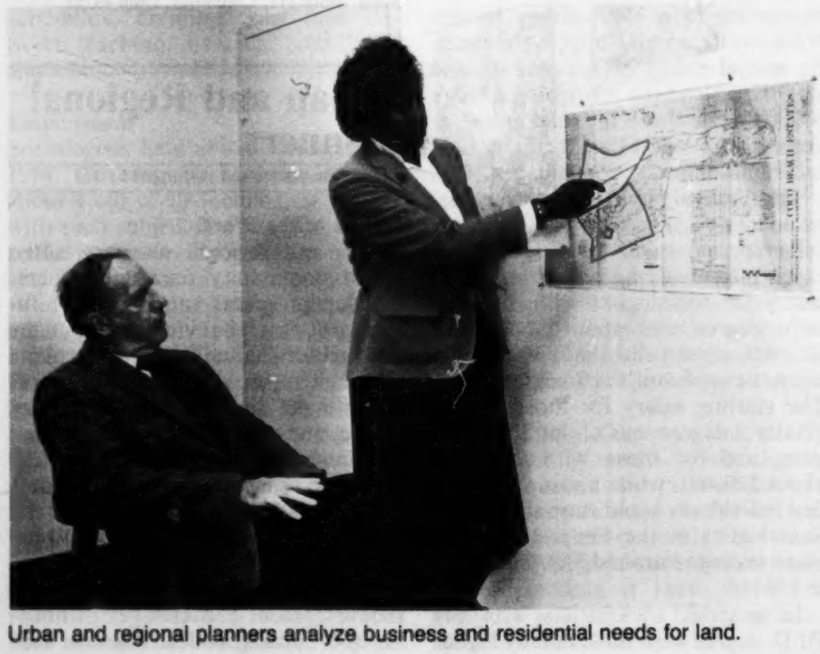
Working Conditions

Urban and regional planners spend most of their time in offices. To be familiar with areas that they are developing, however, they occasionally spend time outdoors examining the features of the land under consideration for development, its current use, and the types of structures existing on it. Although most planners have a scheduled 40-hour workweek, they sometimes must attend evening or weekend meetings or public hearings with citizens' groups.

Employment

Urban and regional planners held about 17,000 jobs in 1984. Local government planning agencies—city, county, or regional—employ over 3 out of 5. An increasing proportion of public agency planners work in small jurisdictions with populations under 50,000. State and Federal agencies that deal with housing, transportation, or environmental protection employ most of the rest. The largest Federal employers are the Departments of Transportation, Defense, and Housing and Urban Development.

Some planners do consulting work, either part time in addition to a regular job, or full time for a firm that provides services to private developers or government agencies. Some planners work for surveying firms, market research organizations, or large land developers.


Urban and regional planners analyze business and residential needs for land.

Training, Other Qualifications, and Advancement

Employers often seek workers who have advanced training in urban or regional planning. Most entry jobs in Federal, State, and local government agencies require 2 years of graduate study in urban or regional planning, or the equivalent in work experience. Although the master's degree in planning is the usual requirement at the entry level, some people who have a bachelor's degree in city planning, architecture, or engineering may qualify for beginning positions. Courses in real estate, finance, and management are highly recommended. In addition, familiarity with statistical techniques and computer usage is desirable.

In 1984, about 80 accredited colleges and universities offered a master's degree in urban or regional planning. Although students holding a bachelor's degree in planning, architecture, or engineering may earn a master's degree after 1 year, most graduate programs in planning require 2 years. Graduate students spend considerable time in workshops or laboratory courses learning to analyze and solve urban and regional planning problems and often are required to work in a planning office part time or during the summer.

Candidates for jobs in Federal, State, and local government agencies usually must pass civil service examinations to become eligible for appointment.

The American Institute of Certified Planners, a branch of the American Planning Association (APA), grants certification to individuals with the appropriate combination of education and professional experience who pass an examination. Data on APA membership indicate that certified urban planners tend to hold the more responsible, better paying positions in their field.

Planners must be able to think in terms of spatial relationships and visualize the effects of their plans and designs. They should be flexible and able to reconcile different viewpoints to make constructive policy recommendations. The ability to write clearly and effectively is important.

After a few years' experience, urban and regional planners may advance to assignments requiring a high degree of independent judgment such as designing the physical layout of a large development or recommending policy, program, and budget options. Some are promoted to jobs as planning directors and spend a great deal of time meeting with officials in other organizations, speaking to civic groups, and supervising other professionals. Further advancement occurs through a transfer to a large city with more complex problems and greater responsibilities.

Job Outlook

Employment of urban and regional planners is expected to grow more slowly than the average for all occupations through the mid-1990's. Demand will be spurred by the continuing importance of environmental, economic, and energy planning; interest in zoning and land-use planning in undeveloped and nonmetropolitan areas, including coastal areas; the need to replace old public facilities such as bridges, highways, and sewers; and expected population growth in suburban locations and in the South and West. However, slow growth in local government spending through the mid-1990's is expected to limit growth of urban planner jobs. Therefore, most jobs will arise from the need to replace experienced planners who transfer to other occupations, retire, or leave the labor force for other reasons.

In recent years, qualified applicants have exceeded openings in urban or regional planning, and the situation is expected to persist. As a result, some persons trained as planners may have to accept jobs in other areas of public policy and administration. An increasing proportion are expected to find urban planner or research or administrative jobs in the private sector—in real estate development firms, consulting firms, banks, utility companies, and engineering, architectural, and surveying firms.

Graduates of academic institutions with accredited planning programs should have the best job prospects. With increasing competition, geographic mobility and the willingness to work in small towns or rural areas are important for many jobseekers.

Earnings

According to a 1983 survey by the American Planning Association, urban and regional planners earned a median annual salary of about $29,600. The median annual salary of planners in city, county, and other local governments was $28,100; in State governments, $30,000; in private consulting firms, $35,000; in business, $35,000; and in nonprofit foundations, $30,000. For planners with over 10 years' experience, county and joint city/county agencies paid about $35,000 annually, while private businesses and consulting firms paid about $44,400. Directors of public planning agencies earned as much as $7,000 more than staff members at comparable levels of experience. Salaries of planners in large jurisdictions may be as much as $6,000 a year higher than their counterparts in small jurisdictions.

Planners with a master's degree were hired by the Federal Government at a starting average salary of $21,800 a year in 1985. In some cases, persons having less than 2 years of graduate work could enter Federal service as interns at yearly salaries of about $14,400 or $17,800. Salaries of urban and regional planners employed by the Federal Government averaged $38,200 a year in 1984.

Related Occupations

Urban and regional planners develop plans for the orderly growth of urban and rural communities. Others whose work is related to the work of planners include architects, landscape architects, city managers, civil engineers, geographers, and urban designers.

Sources of Additional Information

Additional information on careers and salaries in urban and regional planning, a list of schools offering training, and job referrals are available from:

American Planning Association, 1776 Massachusetts Ave. NW., Washington, D.C. 20036.

Social and Recreation Workers

Those considering a career in social work or recreation should be "people oriented," for helping people is what the work is all about. Social workers and recreation workers use a variety of techniques to help people cope with crises or live fuller lives.

Social workers assist individuals and families whose lives are being torn apart by poverty, alcoholism, drug abuse, behavior problems, or illness. They find families to adopt or provide foster care for children whose parents are unable to take care of them; see that needy families are able to give their children proper food, health care, and schooling; and step in when there is evidence of parental neglect or abuse. *School social workers* help students who have severe personal or family problems. *Group workers* give guidance and support so that young people will develop into responsible adults. Some social workers do corrections work, by counseling juvenile delinquents and serving as *probation officers* or *parole officers*. *Medical social workers* counsel hospital patients and advise the family—perhaps suggesting arrangements for home care after the patient leaves the hospital. *Psychiatric social workers*, usually employed in hospitals, clinics, or mental health centers, help patients respond to their treatment and serve as a link with the family and the community at large.

The profession is giving growing attention to directing and influencing social change. Social planners work with health, housing, transportation, and other planners to suggest ways of making communities more wholesome places in which to live. Social workers use various forms of direct action to help people deal with some of the basic forces that shape their lives. They may, for example, do research to identify community needs; draft legislation; or comment on government proposals in areas such as housing, health, and social and welfare services. Or they may help organizations in the community work for social betterment.

Recreation workers, too, help individuals and groups in a number of different ways. They develop and supervise activity programs for children, teenagers, and adults. Some specialize in therapeutic recreation, and plan and coordinate activities for people who are handicapped, emotionally disturbed, or chronically ill. Recreation workers often operate as part of a team, working with therapists, nurses, physicians, social workers, counselors, and educators.

People enter professional positions in social work and recreation from a variety of backgrounds. To a certain extent, an applicant's formal education determines the amount of responsibility given and advancement opportunities. A master's in social work (MSW) is preferred or required for many social work positions, while a college degree with a major in recreation is increasingly important for those aspiring to a career in recreation or leisure services. In both fields, however, training is offered at the associate, bachelor's, master's, and Ph.D. levels. Ordinarily, a candidate with an associate degree would be offered a job as an activity leader or casework aide, while someone with a Ph.D. would be considered for a position in teaching, research, or administration. But the job market does not always operate as predictably as this; actual hiring decisions vary from time to time and place to place. Experience, or academic training in a related field, may be the decisive consideration.

New graduates are likely to experience competition for jobs through the mid-1990's. However, the job market will be more crowded in some fields of specialization and some parts of the country than in others. More detailed information about the job outlook appears in the statements that follow.

Social Workers

(D.O.T. 189.267-010, 195.107-010 through -046, .137-010, .164-010, .167-010, -014, -030, and -034, .267-018, .367-018 and -026)

Nature of the Work

Social workers are community troubleshooters. Through direct counseling, referral to other services, or policymaking and advocacy, they help individuals, families, and groups cope with their problems. Those in the area of planning and policy help people understand how social systems operate and propose ways of bringing about needed change in institutions such as health services, housing, or education. Among the major helping professions, social work is distinguished by a tradition of concern for the poor and the disadvantaged.

The nature of the problem and the time and resources available determine which of several social work methods will be used. When necessary, the social worker refers clients to other professional or community resources. Using their training in human behavior, personality theory, and social group relations, for example, social workers might identify the need for assistance of children, teenagers, young adults, or older persons in places such as community centers, schools, hospitals, nursing homes, and correctional institutions. Social workers work in conjunction with or coordinate the efforts of civic, religious, business, and union organizations to combat social problems through community programs. For a neighborhood or larger area, they may help plan and develop health, housing, welfare, and recreation services. Social workers often coordinate existing services, organize fundraising for community social welfare activities, and aid in developing new community services.

Social workers who specialize in family services counsel individuals, work to strengthen personal and family relationships, and help clients cope with problems. They provide information and referral services in many areas—family budgeting and money management, locating housing, homemaker assistance for the elderly, job training, and day care for children of working parents.

Improving the well-being of children and youth is the job of social workers who specialize in child welfare. They may advise parents on the care of severely handicapped infants, counsel children and youth with social adjustment difficulties, and arrange homemaker services during a parent's illness. Social workers may institute legal action to protect neglected or abused children, help unmarried parents, and counsel couples about adoption. After proper evaluation and home visits, they may place children for adoption or in foster homes or institutions. If children have serious problems in school, child welfare workers may consult with parents, teachers, counselors, and others to identify the underlying problems.

Medical social workers are trained to help patients and their families with problems that may accompany illness or inhibit recovery and rehabilitation. They work in hospitals, hospices, health maintenance organizations, nursing homes, rehabilitation centers, and offices of physicians.

Hospital social workers may work with patients or with families of patients suffering from emotionally devastating illnesses. Discharge planning is an increasingly important area of practice for hospital social workers because prospective payment, Medicare's new system of paying for hospital care, has made timely discharge a factor in the hospital's financial well-being. Other roles are evolving, too. In some hospitals, social workers undertake primary care functions in departments of pediatrics or obstetrics. They may help organize health screening and health education programs, collaborate with community agencies to coordinate care, or coordinate employee assistance programs.

The mental health field attracts the most social workers. Much effort has gone into developing community residential facilities and an array of supportive services for the mentally disabled—services such as outreach, crisis intervention, social rehabilitation, and training in skills of everyday living, to name a few. Social workers provide these services in community mental health centers, outpatient psychiatric clinics, and "drop-in" centers. Providing individual and group therapy is one of the principal tasks of social workers in State mental hospitals, Veterans Administration hospitals, private psychiatric hospitals, and psychiatric units of general hospitals.

Many of the small but growing number of social workers in private practice are clinical social workers. Like other mental health professionals, they offer psychotherapy or counseling to individuals, families, or groups. They might counsel the families of troubled adolescents, help couples deal with marital difficulties, or organize group sessions for families of cancer victims, for example.

Social workers who specialize in the field of aging are also increasing in number. They plan and evaluate services for the elderly, and help older persons and their families deal with difficulties brought about by diminished capacities and changed circumstances. In nursing homes, for example, they help patients and their families adjust to the need for long-term institutional care.

Other social workers specialize in corrections. Correctional treatment specialists provide direct services for inmates of penal or correctional institutions, while probation and parole officers help offenders who are eligible for parole readjust to society. They counsel on the social problems that arise on returning to family and community life, and also may help secure necessary education, training, employment, or community services.

Working Conditions

Most social workers have a 5-day, 35- to 40-hour week. However, many, particularly in private agencies, work part time. Many work evenings and weekends to meet with clients, attend community meetings, and handle emergency situations. Extra leave is generally granted for overtime. Because social workers often must visit clients or attend meetings, some travel may be necessary.

Employment

Social workers held 335,000 jobs in 1984. About 2 out of 5 jobs were in State, county, or municipal government agencies; relatively few were in the Federal Government. Social workers in the public sector are employed primarily in departments of human resources, social services, mental health, health, housing, education, and corrections. Those in the private sector work for voluntary nonprofit agencies; community and religious organizations; hospitals, nursing homes, and home health agencies; and other human service agencies.

Job settings vary considerably. Some social workers are employed in business and industry, as "industrial" or "occupational" social workers. They generally are located in the personnel department or health unit, and support employee welfare through counseling, educational programs, and referral to community agencies. Industrial social workers might, for example, counsel employees about emotional problems, alcoholism, or drug abuse.

Although employment is concentrated in urban areas, many social workers work with rural families. A small number of social workers—employed by the Federal Government and the United Nations or one of its affiliated agencies—serve in other parts of the world.

Listening is an important part of a social worker's job.

Training, Other Qualifications, and Advancement

A bachelor's degree is the minimum requirement for most professional positions in this field. Besides the bachelor's in social work (BSW), undergraduate majors in psychology, sociology, and related fields satisfy hiring requirements in many social service agencies. A master's degree in social work (MSW) is generally required for positions in the mental health field and is almost always necessary for supervisory, administrative, or research positions. A doctorate in social work usually is required for teaching and is desirable for some research and administrative jobs.

In 1985, there were 354 accredited BSW programs and 89 MSW programs. BSW programs prepare graduates for direct service positions such as caseworker or group worker. Classroom instruction is offered in social work practice, social welfare policies, human behavior and the social environment, and social research methods. All accredited programs require 400 hours of supervised field experience.

An MSW degree is preferred for clinical positions and is a decided asset for advancement to a supervisory position. It is essential for social workers in private practice. Two years of specialized study, including 900 hours of supervised field instruction, or internship, are required to earn a master's degree in social work. Field placement affords an opportunity to test one's suitability for social work practice. At the same time, the student may develop expertise in a specialized area and make personal contacts that later are helpful in securing a permanent job. Previous training in social work is not required for entry into a graduate program, but courses such as psychology, sociology, economics, political science, history, social anthropology, and urban studies, as well as social work, are recommended. Some graduate schools offer accelerated MSW programs for qualified applicants.

A limited number of scholarships and fellowships are available for graduate education. A few social welfare agencies grant workers educational leave to obtain graduate education.

Career advancement usually takes the form of promotion to supervisor, administrator, or director, although some social workers go into teaching, research, or consulting. Like other administrators, directors of social service agencies hire, train, and supervise staff, develop and evaluate agency programs, make budget decisions, solicit funds, and represent the agency in public.

Private practice offers variety, prestige, and the potential for much higher pay than most agency jobs. Social workers who wish to advance professionally without taking the supervisory or administrative route often consider private practice. Ordinarily, this means clinical practice—counseling individuals or groups—although some private practitioners specialize in organizational consulting. Not only an MSW but sufficiently varied work experience to develop a network of contacts for referral purposes is usually a prerequisite for a career as a private practitioner. Entrepreneurial ability is important for success in this rapidly developing but highly competitive field.

In addition to experience, which is essential, advancement in the social service field often requires an advanced degree. More than 40 schools of social work offer post-master's programs, most of which lead to a doctoral degree. Increasingly, social workers seeking to broaden their career options are pursuing graduate studies in related fields including human services administration, public administration, business administration, health services administration, education, and law. A number of graduate programs have developed joint degree programs in social work and another discipline.

In 1985, 33 States had licensing or registration laws regarding social work practice and the use of professional titles. Voluntary certification is offered by the National Association of Social Workers (NASW), which awards the title ACSW (Academy of Certified Social Workers) to those who qualify. For clinical social workers, professional credentials include listing in the *NASW Register of Clinical Social Workers* or in the *Registry of Health Care Providers in Clinical Social Work*.

Social workers should be emotionally mature, objective, and sensitive, and should possess a basic concern for people and their problems. They must be able to handle responsibility, work independently, and maintain good working relationships with clients and coworkers. Volunteer, part-time, or summer work as a social work aide offer ways of testing one's interest in pursuing a career in this field.

Job Outlook

Employment of social workers is expected to increase faster than the average for all occupations through the mid-1990's, reflecting public and private response to the needs of a growing and aging population. Demand for social workers is governed by funding; trends in public, private, and third-party spending for social work services are largely responsible for patterns of job growth. The need to replace social workers who leave the occupation or stop working is expected to be the principal source of jobs, however.

Prospects in public agencies are not as bright as they once were, due to the employment impact of anticipated budget constraints plus the trend toward "declassification" that is taking hold in more and more States. Declassification, or revision of State civil service regulations, may dampen demand for MSW's in public agencies since BSW's can legally perform the same job under revised regulations. Despite somewhat slower growth through the mid-1990's, State and local governments will retain their importance as a leading employer of social workers, and replacement needs alone will generate many job openings in this sector.

In elementary and secondary schools, little job growth is foreseen. Substantial expansion in the number of school social workers has already occurred in response to the Education for All Handicapped Children Act of 1975; only modest expansion is expected through 1995. This reflects anticipated trends in elementary and secondary school enrollments.

Prospects for hospital social workers are difficult to assess. A major employment setting, hospitals provide 1 out of every 10 social work jobs. Financing and organizational changes in this sector will affect the nature of the hospital social worker's job: Contacts with community agencies and organizations will take on unprecedented importance because of the pivotal role of discharge planning. Social workers in community-based programs for the elderly reportedly are being recruited for hospital social work jobs because of their extensive knowledge of community resources. Less certain are prospects for growth. It seems unlikely that employment of hospital social workers will increase much, if at all, in view of the anticipated slowdown in hospital industry growth.

Home health is emerging as an increasingly important area of practice, not only because hospitals are moving to release patients more quickly, but because of the prevalence of functional disabilities among older persons requiring assistance in activities of daily living. Social workers in the home health field are primarily engaged in evaluation, assessment, and case management, on the one hand, and administration and supervision, on the other.

Demand for social workers is expected to grow in outpatient facilities, including health maintenance organizations (HMO's) and rehabilitation facilties that offer alcohol and drug abuse programs. Financing is not an obstacle, as a rule; HMO's provide comprehensive care for a preestablished fee, and alcohol and drug rehabilitation programs often are covered by employers or by health insurance, although some patients pay their own costs. Services provided by social workers in HMO's include counseling on teenage pregnancy, stress management, substance abuse, abortion, crisis intervention for cases of spouse or child abuse, assistance for the elderly, and case management.

Substantial growth is projected for social work jobs in private agencies that provide services for abused and neglected children, troubled youth, rape and spouse abuse victims, older people and their families, refugees, farm workers, couples with marital difficulties, and so forth.

Opportunities for social workers in private practice will continue to expand, in part because of growing acceptance of private social work practice by the profession and by the public at large, but also because of the anticipated availability of funding from health insurance and from an increasingly affluent population willing to pay for professional help with personal problems. Growing corporate support for employee assistance programs is expected to spur demand for the services of private practitioners, some of whom contract with corporations to run training sessions on group dynamics, or counsel employees on a variety of problems.

Entry into private practice does not guarantee success. Private practitioners must be able to market themselves to prospective purchasers of their services such as schools, health care providers, corporations, or individuals. Moreover, they must be prepared to deal with competition from psychologists, psychiatric nurses, counselors, and other mental health providers.

Job prospects for social workers vary a great deal. Opportunities differ, depending upon academic credentials, experience, and field of practice. Geographic location is a consideration, too. Competition is keen in cities where training programs for social workers abound. This competition is certain to intensify if social services are cut back in response to budget pressures on State and local governments. At the same time, population growth in the Sunbelt States is spurring expansion of social service programs there, and some isolated rural areas are finding it difficult to attract and retain qualified staff.

Trends in enrollment in social work education will affect job prospects for social workers through the mid-1990's. The number of social work degrees awarded each year peaked in the late 1970's and has been declining ever since (see chart). A number of factors, of which the impending decrease in the college-age population is the most important, point to a continued decline.

If fewer people prepare for social work careers while demand continues to grow, conditions in the job market are likely to improve. Job search problems of MSW's should abate and prospects for BSW's probably will improve. Very strong competition will continue, however, for the substantial number of associate and bachelor's degree holders seeking entry level human service jobs that do not require formal preparation in social work.

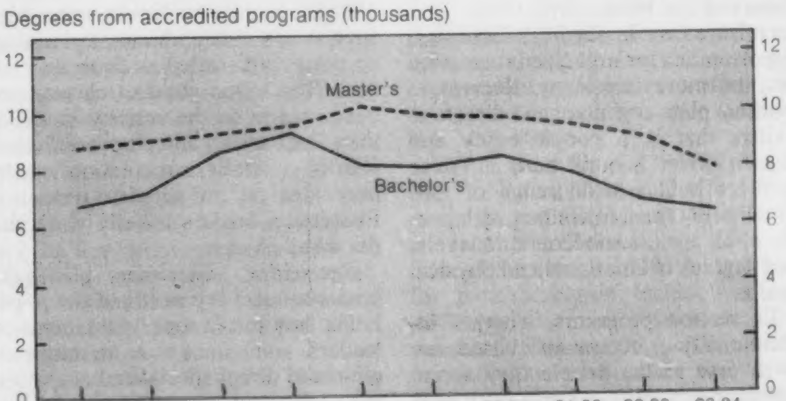
Earnings

Salaries for social workers at all levels vary greatly by type of agency (private or public; Federal, State, or local) and geographic region, but generally are highest in large cities and in States with sizable urban populations. Private practitioners, administrators, teachers, and researchers often earn considerably more than other types of social workers.

The average minimum salary for social caseworkers (positions requiring a BSW) was about $15,700 in 1984, according to a survey conducted by the International Personnel Management Association; for casework supervisors (positions requiring an MSW), the average minimum salary was about $20,100.

The average annual starting salary for social workers in hospitals and medical centers (positions requiring an MSW) was about $19,300 in 1984, according to a survey conducted by the University of Texas Medical Branch. The average salary for expe-

The number of degrees awarded in social work is declining.



SOURCE: Council on Social Work Education rienced social workers in these settings was about $25,500.

In the Federal Government, social workers with an MSW started at $21,804 in 1985; average earnings for social workers in the Federal service were $30,800 in 1984. Graduates with a Ph.D. or job experience may start at a higher salary. Most social workers in the Federal Government are employed by the Veterans Administration and the Departments of Health and Human Services, Education, Justice, and Interior.

Related Occupations

Through direct counseling or referral to other services, social workers help people solve a range of personal problems. Workers in occupations with similar duties include the clergy, counselors, counseling psychologists, and vocational rehabilitation counselors.

Sources of Additional Information

For information about career opportunities in social work, contact:

National Association of Social Workers, 7981 Eastern Ave., Silver Spring, Md. 20910.

The Council on Social Work Education publishes an annual *Directory of Accredited BSW Programs* and *Directory of Accredited MSW Programs*, which may be purchased for $2 each, postpaid. These and other publications are available from:

Council on Social Work Education, 1744 R St. NW., Washington, D.C. 20009.

Recreation Workers

(D.O.T. 159.124-010; 187.137-010; 195.227-010 and -014; and 352.167-010)

Nature of the Work

As leisure time in our lives increases, opportunities for organized recreation become more important. Recreation workers plan, organize, and direct activities that help people enjoy and benefit from leisure hours. These workers hold a wide range of jobs which bring them in contact with people of all ages, socioeconomic levels, and degrees of emotional and physical health.

Recreation programs, whether institutionally or community based, are as diverse as the people they serve. Employment settings range from pristine wilderness areas to health clubs in the city center. At local playgrounds and community centers, for example, recreation personnel organize and conduct a variety of leisure activities, including arts, crafts, fitness, and sports. Other employment settings include parks, camps, campgrounds, and recreational areas; schools, churches, and synagogues; retirement communities, nursing homes, senior centers, and adult day care programs; military bases; and correctional institutions.

Camp counselors lead and instruct campers in nature-oriented forms of recreation such as swimming, hiking, and horseback riding as well as outdoor education. They also provide campers with specialized instruction in a particular area such as music, drama, gymnastics, tennis, or computers. In resident camps, the staff must insure that the campers have adequate living conditions.

Recreation personnel in industry organize and direct leisure activities and athletic programs for employees and their families such as bowling and softball leagues, social functions, and, to an increasing extent, exercise and fitness programs.

Recreation workers should not be confused with *recreational therapists*, who help individuals recover or adjust to illness, disability, or specific social problems. The work of recreational therapists is described elsewhere in the *Handbook*.

Recreation workers occupy a variety of positions at different levels of responsibility. *Recreation leaders* provide face-to-face leadership and are responsible for a recreation program's daily operation. They may give instruction in crafts, games, and sports; keep records; and maintain recreation facilities. Recreation leaders who give instruction in specialties such as art, music, drama, swimming, or tennis are called *activity specialists*. They often conduct classes and coach teams in the activity in which they specialize. A camp counselor, who is generally a recreation leader, may also be an activity specialist. Recreation leaders usually work under a supervisor.

Recreation supervisors plan programs to meet the needs of the population they serve; supervise recreation leaders, sometimes over an entire region; and direct specialized activities.

Working Conditions

While the average week for recreation workers is 35-40 hours, people entering this field should expect some night work and irregular hours. Workers often spend much time outdoors.

The work setting for recreation workers may be anywhere from a vacation cruise ship to a woodland recreational park. Generally, employment follows overall population patterns; most jobs are in the urban and suburban areas where the majority of Americans live. Jobs in camping are found mostly in the less populated areas of the country because of the outdoor orientation of camping programs. Some camp workers receive room and board as part of their compensation.

Employment

Recreation workers held about 123,000 jobs in 1984. (This estimate does not include many summer workers.) Nearly 40 percent of the jobs were in government agencies, primarily in park and recreation departments at the municipal and county levels. State park systems employ some recreation workers, and the Federal Government employs a small number of recreation specialists, sports specialists, outdoor recreation planners, and recreation assistants and aides for programs run by the Veterans Administration and the Departments of Defense and Interior.

Nearly 25 percent of the jobs were in membership organizations with a civic, social, fraternal, or religious orientation—the Boy Scouts, the Y.W.C.A., and Red Cross, for example. Not quite 15 percent were in programs run by social service organizations (senior centers and adult day care programs, for example) or in residential care facilities such as halfway houses, group homes, and institutions for delinquent youth.

Other employers include nursing homes and, increasingly, commercial recreation establishments—including amusement parks, sports and entertainment centers, wilderness and survival enterprises, tourist attractions, vacation excursions, hotels and other resorts, camps, health spas, athletic clubs, apartment complexes, and other settings.

The recreation field is characterized by an unusually large number of part-time, seasonal, and volunteer jobs. Some volunteers serve on local park and recreation boards and commissions. The vast majority, however, serve as volunteer activity leaders at local playgrounds, or in youth organizations, camps, nursing homes, hospitals, senior centers, and other settings. Volunteer experience and part-time work during school may lead to a full-time job. The largest number of paid employees in the recreation field are part-time or seasonal workers. Typical jobs include summer camp counselors and playground leaders, lifeguards, craft specialists, and after-school and weekend recreation program leaders. Many jobs are filled by teachers and college students.

Training, Other Qualifications, and Advancement

Educational requirements for jobs in this field range from a high school diploma or less for many summer jobs to graduate education for administrative positions in large public systems. Many applicants for full-time career positions are college graduates with majors in recreation, leisure studies, or physical education, but a bachelor's degree in any liberal arts field may be appropriate. Some jobs require specialized training in a particular field, such as art, music, drama, or athletics, and some require special certification, such as holding a lifesaving certificate to teach swimming.

A college degree is not always necessary. Some recreation positions are filled by high school graduates, while others are filled by graduates of associate degree programs in parks and recreation, social work, and other human service disciplines. A number of jobs in this field are held by college students who work part time while earning a degree.

Most supervisors have a bachelor's degree plus experience. Persons with academic preparation in parks and recreation management, leisure studies, physical education, fitness management, and related fields generally have better prospects for career advancement, although this varies from one employer to another.

A bachelor's degree and experience are considered minimum requirements for administrators. However, increasing numbers are obtaining master's degrees in parks and recreation as well as in related disciplines. Many persons in other disciplines, including social work, forestry, and resource management, pursue graduate degrees in recreation.

In industrial recreation, or "employee services" as this field is more commonly called, companies prefer applicants with a bachelor's degree in recreation and a strong background in business administration.

In 1984, about 200 community and junior colleges offered associate degree park and recreation programs, and 300 colleges and universities offered programs leading to a bachelor's, master's, or Ph.D. degree.

The Council on Accreditation, sponsored by the National Recreation and Park Association and the American Association for Leisure and Recreation, accredits park and recreation curriculums at the bachelor's degree level. Accredited programs provide broad exposure to the history, theory, and philosophy of park and recreation management. Courses are offered in community organization; supervision and administration; recreational needs of special populations such as the elderly or handicapped; and supervised fieldwork. Students have an opportunity to specialize in areas such as therapeutic recreation, park management, outdoor recreation, industrial or commercial recreation, and camp management.

The American Camping Association has developed a curriculum for camp director education in colleges and universities. Many national youth associations offer training courses for camp directors at the local and regional levels.

Persons planning recreation careers must be good at motivating people and sensitive to their needs. Good health and physical stamina are required. Activity planning calls for creativity and resourcefulness. Willingness to accept responsibility and the ability to exercise judgment are important qualities since recreation personnel often work alone. To increase their leadership skills and understanding of people, students are advised to obtain related work experience in high school and college. Such experience may help students decide whether their interests really point to a human service career. Students also should talk to local park and recreation professionals, school guidance counselors, and others.

Certification for this field is offered by the National Recreation and Park Association (NRPA) and the American Camping Association. Over 30 States have adopted NRPA standards for park/recreation technicians and park/recreation professionals. The American Camping Association certifies individuals who meet their standards of professional competence, and so does the National Employee Services and Recreation Association.

Neither registration nor certifica-

At local playgrounds, recreation workers organize and coach sports programs.

tion is usually required for employment or advancement in this field. However, employers faced with an abundance of qualified applicants are likely to give preference to those with professional credentials.

Job Outlook

Employment of recreation workers is expected to grow faster than the average for all occupations through the mid-1990's. Factors that point to future expansion of this field include a growing number of people with both leisure time and the money to purchase leisure services; rapidly increasing demand for recreational opportunities in nursing homes, senior centers, and retirement communities; and more activity programs for special populations such as the emotionally disturbed. Most job openings, however, will result from replacement needs.

The outlook for recreation workers depends to a large extent on local government funding. Budget constraints are likely to continue, although priorities as well as resources for public services vary from one community to another. Park and recreation programs often are among the first to be cut when budget problems arise.

Camping, however, is supported primarily by the private sector—by profitmaking firms as well as voluntary agencies—and therefore is not as vulnerable to budget cuts as publicly funded recreation programs. Industry-sponsored recreation and fitness programs are popular with employers, who see them as a means of holding down employee health care costs. Continued growth in these programs is foreseen.

Because the field is open to all college graduates regardless of major, the number of applicants for full-time positions in recreation greatly exceeds the number of job openings. Keen competition for jobs is expected to continue. Individuals with recreation experience, and those with formal training in recreation, are expected to have the best opportunities for staff positions. Those with graduate degrees should have the best opportunities for supervisory or administrative positions.

Commercial recreation is expected to offer more favorable opportunities than either the public or voluntary sectors. Hiring practices in commercial recreation vary a great deal, however, and employers' preference for applicants with formal training in recreation, physical education, and related fields has not been clearly established.

The market for recreation and activity jobs in the field of aging is likely to remain competitive due to the large number of qualified applicants. Although employers seek recreational therapists when staffing programs for severely disabled older persons, they consider applicants from a variety of backgrounds for programs that serve the "well elderly." This greatly increases the amount of competition for recreation jobs in senior centers, retirement communities, and local park and recreation department programs for the elderly. Activities programs in nursing homes, too, attract an abundance of jobseekers.

Earnings

According to a 1984 survey by the International Personnel Management Association, municipalities paid recreation workers with a bachelor's degree an average beginning salary of about $15,000; experienced workers, about $19,000. Recreation supervisors earned about $20,500 to start; experienced supervisors earned about $26,000.

According to the American Camping Association, the average salary for camp directors was about $1,600 a month in municipally operated camps in 1984. Salaries for camp directors in private camps were somewhat higher.

Most public and private recreation agencies provide vacation and other fringe benefits such as sick leave and hospital insurance.

Related Occupations

Recreation workers must exhibit leadership and sensitivity in dealing with people. Other occupations that require similar personal qualities include recreation therapists, social workers, parole officers, human relations counselors, school counselors, clinical and counseling psychologists, and teachers.

Sources of Additional Information

Information about careers in recreation and instructions for ordering a directory of educational programs are available from:

National Recreation and Park Association, Division of Professional Services, 3101 Park Center Dr., Alexandria, Va. 22302.

American Association for Leisure and Recreation, 1900 Association Dr., Reston, Va. 22091.

The NRPA also publishes a bulletin of job openings twice monthly.

For information on careers in industrial recreation, contact:

National Employee Services and Recreation Association, 2400 South Downing St., Westchester, Ill. 60153.

For information on careers in camping and summer counselor opportunities, send request and postpaid return envelope to:

American Camping Association, Bradford Woods, Martinsville, Ind. 46151.

For information about a career as an activity coordinator in a nursing home, contact:

American Health Care Association, 1200 15th St. NW., Washington, D.C. 20005.

Religious Workers

Most religious workers are members of the clergy. A career in the clergy requires considerations different from those in other career fields. Persons entering the ministry, priesthood, or rabbinate should do so primarily because they possess a strong religious faith and a desire to help others. Nevertheless, knowledge about the profession, how to prepare for it, and the kind of life it offers is important.

The number of clergy needed depends largely on the number of people who participate in organized religious groups. This affects the number of churches and synagogues established and pulpits to be filled. In addition to the clergy who serve congregations, many others teach or act as administrators in seminaries and in other educational institutions; still others serve as chaplains in the Armed Forces, industry, correctional institutions, hospitals, or on college campuses; some serve as missionaries or work in social welfare agencies.

Persons considering a career in the clergy should seek the counsel of a religious leader of their faith to aid in evaluating their qualifications. Most important are a deep religious belief and a desire to serve the spiritual needs of others. Priests, ministers, and rabbis also are expected to be models of moral and ethical conduct. A person considering one of these fields must realize that the civic, social, and recreational activities of a member of the clergy often are influenced and restricted by the customs and attitudes of the community.

The clergy should be sensitive to the needs of others and able to help people deal with these needs. The job demands an ability to speak and write effectively, to organize, and to supervise others. The person entering this field also must enjoy studying, because the occupation requires continuous learning and demands considerable initiative and self-discipline.

In addition to the clergy, some lay people are religious workers. Many coordinate the activities of various denominational groups to meet the religious needs of students or direct religious school programs designed to promote religious education among members of their faith. Like members of the clergy, they sometimes provide counseling and guidance on marital, health, financial, and religious problems. Lay people are assuming an increasingly important role in nonliturgical functions.

Education and training requirements as well as job prospects for the clergy vary widely among faiths and even among branches within some faiths, as does the need for lay workers. A detailed discussion of training requirements, job prospects, and other information on the clergy in the three largest faiths in the United States—Protestant, Roman Catholic, and Jewish—is presented in the following statements. Information on the clergy in other faiths and on lay religious workers may be obtained directly from leaders of the respective groups.

Protestant Ministers

(D.O.T. 120.007)

Nature of the Work

Protestant ministers lead their congregations in worship services and administer the various rites of the church, such as baptism, confirmation, and Holy Communion. They prepare and deliver sermons and give religious instruction. They also perform marriages; conduct funerals; counsel individuals who seek guidance; visit the sick, aged, and handicapped at home and in the hospital; comfort the bereaved; and serve church members in other ways. Many Protestant ministers write articles for publication, give speeches, and engage in interfaith, community, civic, educational, and recreational activities sponsored by or related to the interests of the church. Some ministers teach in seminaries and colleges and universities.

The services that ministers conduct differ among Protestant denominations and also among congregations within a denomination. In many denominations, ministers follow a traditional order of worship; in others, they adapt the services to the needs of youth and other groups within the congregation. Most services include Bible reading, hymn singing, prayers, and a sermon. In some denominations, Bible reading by a member of the congregation and individual testimonials may constitute a large part of the service.

Ministers serving small congregations generally work personally with parishioners. Those serving large congregations have greater administrative responsibilities and spend considerable time working with committees, church officers, and staff, besides other duties. They may share specific aspects of the ministry with one or more associates or assistants, such as a minister of education who assists in educational programs for different age groups, or a minister of music.

Working Conditions

Ministers are "on call" for any serious troubles or emergencies that involve or affect members of their churches. They also may work long and irregular hours in administrative, educational, and community service activities.

Many of the ministers' duties are sedentary, such as reading or doing research in a study or a library to prepare sermons or write articles.

In some denominations, ministers are reassigned by a central body to a new pastorate every few years.

Employment

In 1984, there were an estimated 416,000 Protestant ministers, of whom 252,000 served individual congregations. Others worked in closely related fields such as chaplains in hospitals, the Armed Forces, universities, and correctional institutions. While there are numerous denominations, most ministers are employed by the five largest Protestant bodies—Baptist, Methodist, Lutheran, Presbyterian, and Episcopalian.

All cities and most towns in the

Preparing a sermon is an important responsibility of ministers.

United States have at least one Protestant church with a full-time minister. Although most ministers are located in urban areas, many serve two or more small congregations in less densely populated areas. Some small churches increasingly are employing part-time ministers who are seminary students, retired ministers, or holders of secular jobs. Unpaid pastors serve other churches with tight budgets. Some churches employ specially trained members of the laity to conduct nonliturgical functions.

Training and Other Qualifications

Educational requirements for entry into the Protestant ministry vary greatly. Some denominations have no formal educational requirements, and others ordain persons having various types of training in Bible colleges, Bible institutes, or liberal arts colleges.

In 1984, about 140 American Protestant theological schools were accredited by the Association of Theological Schools in the United States and Canada. These admit only students who have received a bachelor's degree or its equivalent with a liberal arts major from an accredited college. Many denominations require a 3-year course of professional study in one of these accredited schools or seminaries after college graduation for the degree of master of divinity.

Recommended preseminary or undergraduate college courses include English, history, philosophy, natural sciences, social sciences, fine arts, music, religion, and foreign languages. These courses provide a knowledge of modern social, cultural, and scientific institutions and problems. However, students considering theological study should contact, at the earliest possible date, their denominations and the schools to which they intend to apply, to learn how to prepare for the program they hope to enter.

The standard curriculum for accredited theological schools consists of four major categories: Biblical, historical, theological, and practical. Courses of a practical nature include pastoral care, preaching, religious education, and administration. Many accredited schools require that students work under the supervision of a faculty member or experienced minister. Some institutions offer doctor of ministry degrees to students who have completed additional study, usually 2 or more years, and served at least 2 years as a minister. Scholarships and loans are available for students of theological institutions.

In general, each large denomination has its own school or schools of theology that reflect its particular doctrine, interests, and needs. However, many of these schools are open to students from other denominations. Several interdenominational schools associated with universities give both undergraduate and graduate training covering a wide range of theological points of view.

Persons who have denominational qualifications for the ministry usually are ordained after graduation from a seminary or after serving a probationary pastoral period. Denominations that do not require seminary training ordain clergy at various appointed times. For example, some Evangelical churches may ordain ministers with only a high school education.

Men and women entering the clergy often begin their careers as pastors of small congregations or as assistant pastors in large churches.

Job Outlook

The pressures of rising costs and inadequate financial support due to the anticipated slow growth in church membership are expected to result in only limited growth in the need for ministers through the mid-1990's. The number of persons being ordained has been increasing, and this trend is likely to continue. As a result, new graduates of theological schools are expected to face increasing competition in finding positions, and more experienced ministers will face competition in moving to larger congregations with greater responsibility. The supply-demand situation will vary among denominations and geographic regions. For example, more favorable prospects are expected for ministers in Evangelical churches. Ministers willing to work in rural areas, especially those adjacent to metropolitan regions, also should have relatively favorable opportunities. Most of the openings for ministers through the mid-1990's will arise from the need to replace retirees, and, to a lesser extent, those who die or leave the ministry.

Employment alternatives for newly ordained Protestant ministers who are unable to find positions in parishes include working in youth counseling, family relations, and welfare organizations; teaching in religious educational institutions; and serving as chaplains in the Armed Forces, hospitals, universities, and correctional institutions.

Earnings

Salaries of Protestant clergy vary substantially, depending on age, experience, denomination, size and wealth of congregation, and geographic location. Based on limited information, the estimated average annual income of Protestant ministers was about

$18,000 in 1984. In large, wealthier denominations, ministers averaged $25,000 or more. Fringe benefits, such as housing and transportation, may add as much as 25 percent to a minister's annual salary. Increasingly, ministers with modest salaries earn additional income from employment in secular occupations.

Related Occupations
Protestant ministers advise and counsel individuals and groups regarding their religious as well as personal, social, and vocational development. Other occupations involved in this type of work include social workers, clinical and counseling psychologists, teachers, and counselors.

Sources of Additional Information
Persons who are interested in entering the Protestant ministry should seek the counsel of a minister or church guidance worker. Each theological school can supply information on admission requirements. Prospective ministers also should contact the ordination supervision body of their particular denomination for information on special requirements for ordination.

Occupational information about the Protestant ministry can also be obtained from:

National Council of Churches, Professional Church Leadership, Room 770, 475 Riverside Dr., New York, N.Y. 10115.

Rabbis

(D.O.T. 120.007)

Nature of the Work
Rabbis are the spiritual leaders of their congregations, and teachers and interpreters of Jewish law and tradition. They conduct religious services and deliver sermons on the Sabbath and on Jewish holidays. Like other clergy, rabbis conduct weddings and funeral services, visit the sick, help the poor, comfort the bereaved, supervise religious education programs, engage in interfaith activities, and involve themselves in community affairs.

Rabbis serving large congregations may spend considerable time in administrative duties, working with their staffs and committees. Large congregations frequently have an associate or assistant rabbi. Many assistant rabbis serve as educational directors.

Rabbis serve either Orthodox, Conservative, Reform, or Reconstructionist congregations. Regardless of their particular point of view, all Jewish congregations preserve the substance of Jewish religious worship. Congregations differ in the extent to which they follow the traditional form of worship—for example, in the wearing of head coverings, the use of Hebrew as the language of prayer, or the use of instrumental music or a choir. The format of the worship service and, therefore, the ritual that the rabbis use may vary even among congregations belonging to the same branch of Judaism.

Rabbis also may write for religious and lay publications and teach in theological seminaries, colleges, and universities.

Working Conditions
Rabbis work long hours and are "on call" to visit the sick, comfort the bereaved, and counsel those who need it. Community and educational activities may also require long or irregular hours.

Some of their duties are intellectual and sedentary, such as studying religious texts, researching and writing sermons and articles for publication, and preparing lectures for adult education.

Rabbis have a good deal of independent authority, since they have no formal hierarchy. They are responsible only to the board of trustees of the congregations they serve.

Employment
In 1984, there were an estimated 6,500 practicing rabbis. Over 1,100 Orthodox rabbis served congregations, many of them relatively small. In addition, 800 Conservative, 750 Reform, and 65 Reconstructionist rabbis had synagogues. Most of the rest taught in Jewish Studies programs at colleges and universities. Others worked as chaplains in the military services, in hospitals and other institutions, or in one of the many Jewish community service agencies.

Although rabbis serve Jewish communities throughout the Nation, they are concentrated in major metropolitan areas that have large Jewish populations.

Training and Other Qualifications
To become eligible for ordination as a rabbi, a student must complete a course of study in a seminary. Entrance requirements and the curriculum depend upon the branch of Judaism with which the seminary is associated.

About 30 seminaries train Orthodox rabbis. The Rabbi Isaac Elchanan Theological Seminary and the Beth Medrash Govoha Seminary are representative of Orthodox seminaries. The

A rabbi discusses religious school curriculum with parent.

former requires a bachelor's degree for entry and has a formal 3-year ordination program. The latter has no formal admission requirements but may require more years of study for ordination. The training is rigorous. When students have become sufficiently learned in the Talmud, the Bible, and other religious studies, they may be ordained with the approval of an authorized rabbi, acting either independently or as a representative of a rabbinical seminary.

The Jewish Theological Seminary of America trains rabbis for the Conservative branch. The Hebrew Union College—Jewish Institute of Religion trains rabbis for the Reform branch. Both seminaries require the completion of a 4-year college course, as well as earlier preparation in Jewish studies, for admission to the rabbinical program leading to ordination. A student with a strong background in Jewish studies can complete the course at the Conservative seminary in 4 years; for other enrollees, the course may take as long as 6 years. Normally, 5 years of study are required to complete the rabbinical course at the Reform seminary, including 1 year of preparatory study in Jerusalem. Exceptionally well-prepared students can shorten this 5-year period to a minimum of 3 years.

The Reconstructionist Rabbinical College trains rabbis in the newest branch of Judaism. A bachelor's degree is required for admission. The rabbinical program is based on a 5-year course of study which emphasizes, in each year, a period in the history of Jewish civilization. Graduates are awarded the title "Rabbi" and, with special study, can earn the Doctor of Hebrew Letters degree.

In general, the curriculums of Jewish theological seminaries provide students with a comprehensive knowledge of the Bible, Talmud, Rabbinic literature, Jewish history, theology, and courses in education, pastoral psychology, and public speaking. Students get extensive practical training in dealing with social and political problems in the community. Training for alternatives to the pulpit, such as leadership in community services and religious education, is increasingly stressed.

Some seminaries grant advanced academic degrees in fields such as Biblical and Talmudic reasarch. All Jewish theological seminaries make scholarships and loans available. Newly ordained rabbis usually begin as leaders of small congregations, assistants to experienced rabbis, directors of Hillel Foundations on college campuses, teachers in seminaries and other educational institutions, or chaplains in the Armed Forces. As a rule, experienced rabbis fill the pulpits of large and well-established Jewish congregations.

Job Outlook

The job outlook for rabbis varies among the four major branches of Judaism.

Orthodox clergy currently face keen competition because the number of graduates from Orthodox seminaries is increasing at a more rapid pace than the number of pulpits. Orthodox rabbis willing to work in rural areas should have the best prospects.

Rabbis in the Conservative branch are expected to have good employment opportunities—primarily in inner cities and areas that attract many retirees.

As a result of increasing membership, Reform rabbis should have good employment opportunities, especially in small communities.

Reconstructionist rabbis also are expected to have good employment opportunities. Membership is expanding rapidly and demand is expected to exceed supply.

Many rabbis who do not seek a pulpit work for Jewish social service agencies. Others may teach in a religious educational institution, or serve as chaplain in the Armed Forces or in hospitals, universities, or correctional institutions.

Earnings

Income varies, depending on the size and financial status of the congregation, as well as its denominational branch and geographic location. Rabbis usually earn additional income from gifts or fees for officiating at ceremonies such as bar mitzvahs and weddings.

Based on limited information, annual earnings of rabbis generally ranged from $25,000 to $75,000 in 1984, including fringe benefits.

Related Occupations

Rabbis advise and counsel individuals and groups regarding their religious as well as personal, social, and vocational development. Other occupations involved in this type of work include social workers, clinical and counseling psychologists, teachers, and counselors.

Sources of Additional Information

Persons who are interested in becoming rabbis should discuss their plans for a vocation with a practicing rabbi. Information on the work of rabbis and allied occupations can be obtained from:

The Rabbi Isaac Elchanan Theological Seminary, 2540 Amsterdam Ave., New York, N.Y. 10033. (Orthodox)

Beth Medrash Govoha Seminary, 626 Seventh St., Lakewood, N.J. 08701. (Orthodox)

The Jewish Theological Seminary of America, 3080 Broadway, New York, N.Y. 10027. (Conservative)

Hebrew Union College—Jewish Institute of Religion, Director of Admissions, at any one of three campuses: 1 W. 4th St., New York, N.Y. 10012; 3101 Clifton Ave., Cincinnati, Ohio 45220; 3077 University Mall, Los Angeles, Calif. 90007. (Reform)

Reconstructionist Rabbinical College, Church Road and Greenwood Avenue, Wyncote, Pa. 19095.

Roman Catholic Priests

(D.O.T. 120.007)

Nature of the Work

Roman Catholic priests attend to the spiritual, pastoral, moral, and educational needs of the members of their church. They deliver sermons, administer the sacraments of marriage and of penance, and preside at liturgical functions, such as funeral services. They also comfort the sick, console and counsel those in need of guidance, and assist the poor. In recent years, some priests have paid increasing attention to nonliturgical concerns such as human rights and social welfare.

A priest's day usually begins with morning meditation and Mass and may end with the hearing of confessions or an evening visit to a hospital or home. Many priests direct and serve on church committees, work in civic and charitable organizations, and assist in community projects.

The two main classifications of priests—diocesan (secular) and religious—have the same powers, acquired through ordination by a bishop. The differences lie in their way of life, their type of work, and the church authority to whom they are immediately subject. Diocesan priests generally work individually in parishes assigned by the bishop of their diocese. Religious priests generally work as part of a religious order, such as the Jesuits, Dominicans, or Franciscans. They may engage in specialized activities, such as teaching or missionary work, assigned by superiors of their order.

Both religious and diocesan priests hold teaching and administrative posts in Catholic seminaries, colleges and universities, and high schools. Priests attached to religious orders staff a large proportion of the church's institutions of higher education and many high schools, whereas diocesan priests are usually concerned with the parochial schools attached to parish churches and with diocesan high schools. The members of religious orders do most of the missionary work conducted by the Catholic Church in this country and abroad.

Working Conditions

Priests spend long and irregular hours working for the church and the community.

Religious priests are assigned duties by their superiors in their particular orders. Some religious priests serve as missionaries in foreign countries where they may live under difficult and primitive conditions. Some live a communal life in monasteries where they devote themselves to prayer, study, and assigned work.

Diocesan priests are "on call" at all hours to serve their parishioners in emergency situations. They also have many intellectual duties including study of the scriptures and keeping abreast of current religious and secular events in order to prepare sermons. Diocesan priests are responsible to the bishop in the diocese.

Employment

There were approximately 58,000 priests in 1984, according to the Official Catholic Directory. Over 19,000—primarily diocesan priests—served congregations. There are priests in nearly every city and town and in many rural communities. The majority are in metropolitan areas, where most Catholics reside. Large numbers of priests are located in communities near Catholic educational and other institutions.

Training and Other Qualifications

Preparation for the priesthood generally requires 8 years of study beyond high school in 1 of about 240 seminaries. Preparatory study may begin in the first year of high school, at the college level, or in theological seminaries after college graduation.

High school seminaries provide a college preparatory program that emphasizes English grammar, speech, literature, and social studies. Latin is required and modern languages are encouraged. In growing Hispanic communities, knowledge of Spanish is useful. The seminary college offers a liberal arts program stressing philosophy and religion, the study of man through the behavioral sciences and history, and the natural sciences and mathematics. In many college seminaries, a student may concentrate in any of these fields.

The remaining 4 years of preparation include sacred scripture; dogmatic, moral, and pastoral theology; homiletics (art of preaching); church history; liturgy (Mass); and canon law. Fieldwork experience usually is required; in recent years, this aspect of a priest's training has been emphasized. Diocesan and religious priests attend different major seminaries where slight variations in the training reflect the differences in their duties. Priests commit themselves not to marry.

Postgraduate work in theology is offered at a number of American Catholic universities or at ecclesiastical universities around the world, particularly in Rome. Also, many priests do graduate work in fields unrelated to theology. Priests are encouraged by the Catholic Church to continue their studies, at least informally, after ordination. In recent years, continuing education for ordained priests has stressed social sciences, such as sociology and psychology.

Young men never are denied entry into seminaries because of lack of funds. In seminaries for secular priests, scholarships or loans are available. Those in religious seminaries are financed by contributions of benefactors.

A newly ordained secular priest usually works as an assistant pastor or curate. Newly ordained priests of religious orders are assigned to the specialized duties for which they are trained. Depending on the talents, interests, and experience of the individual, many opportunities for greater responsibility exist within the church.

Job Outlook

More priests will be needed in the years ahead to provide for the spiritual, educational, and social needs of the increasing number of Catholics. In recent years, the number of ordained priests has been insufficient to fill the needs of newly established parishes and other Catholic institutions, and to replace priests who retire, die, or leave the priesthood. This situation is likely to persist and perhaps worsen, if the drop in seminary enrollment

A priest explains the ceremonial procedures to the future newlyweds.

continues and if an increasing proportion of priests retires as expected.

In response to the shortage of priests, certain traditional functions may now be performed by lay deacons and by teams of clergy and laity. Presently about 6,700 lay deacons have been ordained to preach and perform liturgical functions such as distributing Holy Communion and reading the gospel at the Mass. Teams of clergy and laity undertake nonliturgical functions such as hospital visits and meetings. These trends are expected to increase. Priests will continue to offer Mass, administer sacraments, and hear confession, but may be less involved in teaching and administrative work.

Earnings

Diocesan priests' salaries vary from diocese to diocese. Based on limited information, most salaries range from $4,000 to $6,000 a year. The diocesan priest also may receive a car allowance, free room and board in the parish rectory, and fringe benefits such as group insurance and retirement benefits in the diocese.

Religious priests take a vow of poverty and are supported by their religious order.

Priests who do special work related to the church, such as teaching, usually receive a partial salary which is less than a lay person in the same position would receive. The difference between the usual salary for these jobs and the salary that the priest receives is called "contributed service." In some of these situations, housing and related expenses may be provided; in other cases, the priest must make his own arrangements. Some priests doing special work may receive the same compensation that a lay person would receive.

Related Occupations

Roman Catholic priests advise and counsel individuals and groups regarding their religious as well as personal, social, and vocational development. Other occupations involved in this type of work include social workers, clinical and counseling psychologists, teachers, and counselors.

Sources of Additional Information

Young men interested in entering the priesthood should seek the guidance and counsel of their parish priests. For information regarding the different religious orders and the secular priesthood, as well as a list of the seminaries which prepare students for the priesthood, contact the diocesan Director of Vocations through the office of the local pastor or bishop.

Occupational information about the Roman Catholic priesthood can also be obtained from:

National Catholic Vocation Council, 1307 S. Wabash Avenue, Chicago, Ill. 60605.

Teachers, Counselors, Librarians, Archivists, and Curators

Teaching, librarianship, and counseling are "people-oriented" fields that involve helping others learn, acquire information, or gain insight into themselves. Archivists and curators are more involved with "things." They may also help people learn and gain information, but do not usually work as closely with them as teachers, librarians, and counselors. These professionals usually require a bachelor's degree, although some require a master's or doctoral degree.

Teaching is one of the largest occupations in the United States. In 1984, kindergarten and elementary school teachers held about 1.4 million jobs, secondary school teachers held 1.0 million, and college and university teachers held about 730,000. Many others held jobs as teachers in preschool programs and nursery schools; in public and private vocational education programs; in dance, music, and art studios; and in other places. Librarianship and counseling are much smaller fields. In 1984, librarians and audiovisual specialists held approximately 160,000 jobs and counselors about 150,000. Archivists and curators held an estimated 11,000 jobs in 1984.

Teaching takes place in many different settings, and most people would agree that education is a lifelong process. But perhaps our most influential educational experiences occur during the period of formal education, beginning in preschool or kindergarten and extending through early adulthood. Teachers help students gain the skills they need to function in the world around them, encouraging them to explore many subjects and master some; to identify interests and values; to learn to make decisions; and to think for themselves.

Librarianship is undergoing profound changes as libraries try to keep up with the information explosion, assimilate new technology, and respond to budget pressures. Many libraries are restructuring services and looking for new ways to share resources.

Public libraries, long thought of as centers for recreational reading, are enlarging the scope of their activities and finding additional ways to serve the community—as information and referral services, cultural centers, and learning centers or "open universities." School libraries, also called media centers because so much of their collection is not in printed form, have become an integral part of the learning experience in elementary and secondary schools. College and university libraries provide both reference collections for students and support for highly specialized research. Special libraries and documentation centers, which generally tailor services to a single group of users, have led the field in the use of computers for information storage and retrieval. Expertise in library automation is important for all kinds of librarians, however.

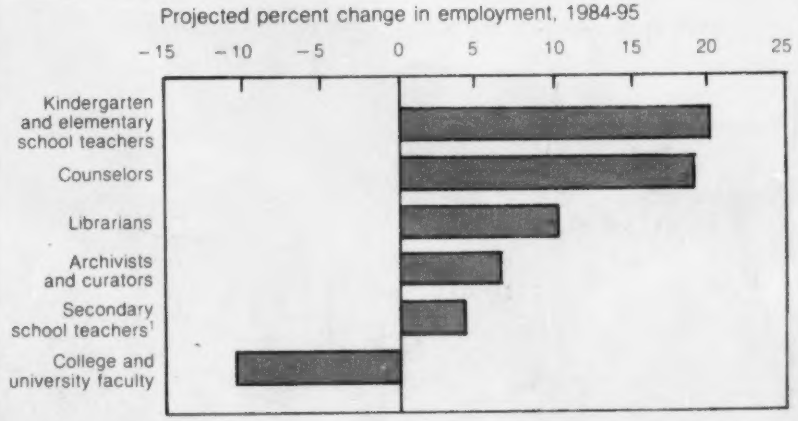
Counseling has many dimensions. Counselors provide personal, social, and vocational guidance in a wide range of settings, including schools and colleges, rehabilitation centers, community mental health centers, halfway houses, and counseling centers for women, minorities, veterans, ex-offenders, and alcohol or drug abusers. Some employers require a master's degree in counseling, counseling psychology, social work, or a related field, but others do not.

Archivists and curators acquire, catalog, restore, maintain, and exhibit historical documents, works of art, plants, buildings, and battle sites. Most archivists and curators work for Federal, State, or local government agencies or private museums.

Job prospects in some occupations, such as college and university faculty, and archivists and curators are expected to be competitive overall. Job prospects for elementary school teachers are expected to be more favorable as enrollments increase. Best job opportunities for counselors are expected in nonschool settings, and for librarians in special libraries.

More detailed information on job

Growth in education-related occupations will vary greatly through the mid-1990's.



[1] No growth until after 1990.

SOURCE: Bureau of Labor Statistics

outlook and alternative careers appears in the statements that follow.

Kindergarten and Elementary School Teachers

(D.O.T. 092.227-010, -014; 094.224-010, .227-010 through -022; 099.224-010)

Nature of the Work

Kindergarten and elementary school teachers play a vital role in the development of children. What is learned or not learned in the early years can shape children's views of themselves and the world, and affect later success or failure in school and work.

Kindergarten and elementary school teachers introduce children to the basics of mathematics, language, science, and social studies. They try to instill good study habits and an appreciation for learning, as well as observe and evaluate each child's performance and potential. Elementary school teachers may use films, slides, computers, or instructional games to help children learn in creative ways. They also arrange class trips, speakers, and class projects.

Teachers keep track of their students' social development and health. They observe each child's behavior and discuss problems—such as habitual resistance to authority—with the parents. Teachers also report health problems to parents and school health officials.

Most elementary school teachers instruct a group of children in several subjects while providing individual attention as much as possible. In some schools, two or more teachers team teach and are jointly responsible for a group of students or for a particular subject. An increasing number of elementary school teachers specialize and teach one or two subjects to several classes. Some teach subjects such as music, art, or physical education, while others concentrate on the special needs of certain groups—those who have reading problems or those who do not speak English, for example.

Much of a teacher's work occurs outside the classroom. Teachers generally prepare lessons and grade papers at home, attend faculty meetings, and supervise extracurricular activities after school. They also serve on faculty committees such as those to revise curricula or to evaluate the school's objectives and the students' performance. To stay up to date on educational materials and teaching techniques, they may participate in workshops and other inservice activities or take college courses.

Many schools employ teacher aides to do clerical work and supervise lunch and playground activities so that teachers can give more individual attention to students.

Job prospects for kindergarten and elementary school teachers have improved.

Working Conditions

Teachers spend much of their time standing or walking. Kindergarten teachers may join their students on the floor to finger paint, cut out pictures, or do other crafts.

A teacher may often have to deal with disruptive, disrespectful, and sometimes even violent children. Teachers may also have students of widely different backgrounds and abilities in the same classroom—those who have little knowledge of English and those who are handicapped, for example. This can be physically, mentally, and emotionally taxing.

Most elementary school teachers work a traditional 2-semester, 10-month school year with a 2-month vacation. Teachers on a 10-month schedule may teach in the summer session or take other jobs. Many enroll in college courses or special workshops. Some teachers in year-round schools work 8-week sessions, are off 1 week between sessions, and have a long midwinter break. This 12-month schedule makes it difficult for teachers to take supplemental jobs.

In most States, the public schools must be in session a minimum number of days. This number varies from 175 to 205 days. In 1985, the average number of instruction days was 184.

Most States as well as the District of Columbia have tenure laws that protect the jobs of teachers who have taught satisfactorily for a certain number of years. A teacher normally must serve a satisfactory probationary period of 3 years before attaining tenure. Tenure is not an automatic guarantee of job security, but it does provide some protection.

Employment

Kindergarten and elementary school teachers held 1,381,000 jobs in 1984. Most elementary school teachers work in public schools that have students in kindergarten through grade six; however, some teach in middle schools that cover the 3 or 4 years between the lower elementary grades and 4 years of high school. Fourteen percent of elementary school teachers work in private schools.

Since kindergarten and elementary school teachers work directly with students, their employment is distributed geographically much the same as the population.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public elementary school teachers to be certified by State education authorities. Some States require teachers in private and parochial schools to be certified as well. Generally, certification is granted by the State Board of Education, the State Superintendent of Education, or a Certification Advisory Committee.

Teachers may be certified to teach either the early childhood grades (usually nursery school through the third grade) or the elementary grades (grades one through six or eight). Some teachers obtain certification to teach special education or reading at the elementary school level.

Requirements for certification vary by State, and school systems may have additional hiring requirements. In ali States and the District of Columbia, however, public kindergarten and elementary school teachers must have a bachelor's degree from an institution with an approved teacher education program. Teacher training programs include a variety of liberal arts courses as well as student teaching and prescribed professional education courses such as philosophy of education, psychology of learning, and teaching methodology. Many States require teachers to obtain a master's degree within a certain period after beginning work.

Seventeen States require applicants for certification to be tested for competency either in basic skills, subject matter, teaching skills, or a combination of these. Twenty-six States have health requirements. Initial teaching certificates range from 1 year to life, but life certificates are becoming less common. Complete information on requirements for elementary school teaching is available from State departments of education or superintendents of schools.

Information about whether a particular teacher training program is approved can be obtained from the institution offering the training or from the State department of education. Many States have reciprocity agreements that allow teachers who are certified in one State to become certified in another.

Kindergarten and elementary school teachers should be creative, dependable, patient, and competent in handling classroom situations. Most important, they should be vitally interested in the educational and emotional development of children.

As teachers gain experience, they may advance to supervisory, administrative, or specialized positions within the school system. Often, however, these positions require additional training and certification and the number of positions is limited. As a result, for most teachers, advancement consists of higher pay rather than additional responsibility or a higher position.

Job Outlook

Job prospects for kindergarten and elementary school teachers are expected to improve. Employment is expected to grow faster than the average for all occupations through the mid-1990's, reflecting rising enrollments. Additional positions also are expected as a result of lower pupil-teacher ratios. Many job openings will also occur to replace teachers who leave the profession. If the number of new college graduates prepared to teach in elementary school remains at the current level, there may be more openings than qualified applicants.

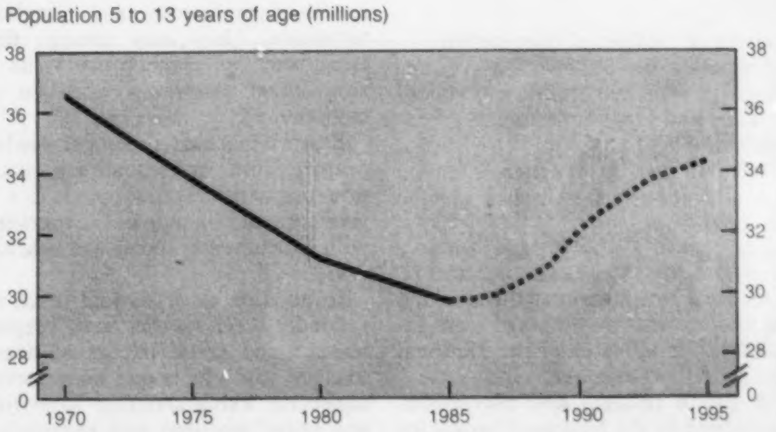
Enrollment levels and employment of classroom teachers are closely associated. The National Center for Education Statistics projects enrollments to increase over the next decade from 27.2 million to almost 32 million, reflecting the rise in the number of births beginning in the mid-1970's.

Enrollment growth will not occur at the same rate in all parts of the country, however. Largely because of migration to the South and West, population growth (and therefore the increase in enrollments) is expected to be greater in those regions.

Whether an elementary school teacher "shortage" develops depends not only on demand for teachers but on supply as well. The basic sources of teacher supply are recent graduates qualified to teach at the elementary school level and former teachers seeking reentry to the occupation. The greater availability of jobs, rising salaries, and heightened public interest in education are encouraging more people to prepare for elementary school teaching and may also attract more people from the teacher reserve pool. The reserve pool is very large because many elementary school teachers are women who left teaching for household responsibilities and also because there had been an oversupply of these teachers for many years. In 1982-83, more than one-third of those who entered elementary school teaching had not worked the previous year because of household responsibilities. If supply responses are adequate, a shortage of elementary school teachers will not develop.

Employment of teachers is also sensitive to changes in State and local expenditures for education. Pressure from taxpayers to limit taxes and spending is likely to inhibit employment growth, while recent emphasis on improving the quality of education could stimulate it.

The elementary school age population will increase after 1985.



SOURCE: Bureau of the Census

Although computers are being used in elementary schools, they are not expected to affect teacher employment, since their major use is for teaching computer concepts, learning enrichment, and remedial drill and practice exercises.

Earnings

According to the National Education Association, public elementary school teachers averaged $23,092 a year in 1984-85. Generally, the Mid-Atlantic and far western States paid the highest salaries.

Collective bargaining agreements cover an increasing number of teachers. In 1984, 33 States and the District of Columbia had laws that required collective bargaining in teacher contract negotiations, and an additional 9 States permitted such bargaining. Most public school systems that enroll 1,000 students or more bargain with teacher organizations over wages, hours, and the terms and conditions of employment.

Related Occupations

Kindergarten and elementary school teaching requires a wide variety of skills and aptitudes, including organizational and administrative abilities; a talent for working with children; communication skills; the power to influence, motivate, and train others; creativity; and leadership ability. Workers in other occupations that require some of these aptitudes include childcare attendants; trainers and employee development specialists; employment interviewers; librarians; personnel specialists; public relations specialists; and social workers and counselors.

Sources of Additional Information

Information on certification requirements is available from local school systems and State departments of education.

Information on teachers' unions and education-related issues can be obtained from:

American Federation of Teachers, 555 New Jersey Ave. NW., Washington, D.C. 20001.

General information on the teaching professions can be obtained from local or State affiliates of the National Education Association.

A list of colleges and universities accredited by the National Council for Accreditation of Teacher Education can be obtained from:

National Council for Accreditation of Teacher Education, 1919 Pennsylvania Ave. NW., Suite 202, Washington, D.C. 20006.

Secondary School Teachers

(D.O.T. 091.221-010, .227-010; 094.224-010, .227-010 through -022; 099.244-010, and .227-022)

Nature of the Work

The high school years are a time of transition from childhood to adulthood. Secondary school teachers facilitate this process. They help students delve more deeply into subjects introduced in elementary school and learn more about themselves and the world.

Secondary school teachers instruct students in a specific subject, such as English, Spanish, mathematics, history, or biology. They may teach a variety of related courses. Social studies teachers, for example, may instruct two 9th grade classes in American History, two 12th grade classes in Contemporary American Problems, and another class in World Geography. For each class, teachers develop lesson plans; prepare, give, and grade examinations; and arrange special activities, such as a class project to devise an urban redevelopment plan for a city.

Teachers design their classroom presentations to meet the individual needs and abilities of as many as 150 students in five different classes. They may arrange tutoring for students or give advanced assignments for highly motivated pupils.

Teachers use a variety of instructional materials including films, slides, overhead projectors, and computer terminals. They may arrange field trips, such as planetarium visits to supplement classroom work on astronomy.

Science teachers also supervise laboratory work, and vocational education teachers teach shop classes to give students "hands-on" experience with instruments, tools, and machinery.

In addition to classroom teaching, secondary school teachers prepare lessons and grade papers at home, oversee study halls and homerooms, supervise extracurricular activities, and attend meetings with parents and school personnel. Teachers also participate in workshops and college classes to keep up to date on their subject specialty and on developments in education.

Working Conditions

Teaching involves long periods of standing and talking and can be physically, mentally, and emotionally tiring. Dealing with disruptive students can be especially exhausting.

Since teachers also spend time in activities outside the classroom, they may work over 40 hours a week. Most teachers work the traditional 10-month school year with a 2-month vacation. Teachers on a 10-month schedule may teach in summer sessions or take other jobs. Many enroll in college courses or special workshops. Teachers in districts with a year-round schedule work 8 weeks, are on vacation for 1 week, and have a 5-week midwinter break. In most States, schools must be in session a minimum number of days. This number varies from 175 to 205 days. In 1985, the average number of instruction days was 184.

The District of Columbia and most States have tenure laws that protect the jobs of teachers who have taught satisfactorily for a certain number of years. A teacher normally must serve a satisfactory probationary period of 3 years before attaining tenure. Tenure is not an automatic guarantee of job security, but it does provide some protection.

Employment

Secondary school teachers held 1,045,000 jobs in 1984. More than 90 percent taught in public schools. Since teachers work directly with students, their employment is distributed much the same as the population.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public secondary school teachers to be certified. Many States require teachers in private and parochial schools to be certified as well. Usually certification is granted by the State Board of Education, the State Superintendent of Education, or a Certification Advisory Committee.

Requirements for certification to teach at the secondary school level vary by State, and school systems may have additional requirements. However, in all States and the District of Columbia, teachers need a bachelor's degree from an approved teacher training program with a prescribed number of credits in the subject they plan to teach. They must also complete student teaching and other professional education courses. Many States require teachers to obtain graduate degrees within a certain time after being hired.

Seventeen States require applicants for teacher certification to be tested for competency either in basic skills, subject matter, teaching skills, or a combination of these. Twenty States also have health requirements. Initial teaching certificates vary from 1 year to life. Life certificates are becoming less common.

Some States have set up alternate or provisional certification plans to attract talented college graduates who do not have education courses needed to qualify for a regular certificate. Under most plans, entrants must have a major in the subject to be taught and pass a general or subject area examination. They teach under the close supervision of experienced educators and take a limited number of college courses in education or participate in specially designed classes. If they are successful, they are eligible for regular certification. Information on regular and alternate certification requirements for secondary school teaching is available from any State department of education or superintendent of schools.

Information about whether a particular teacher training program is approved can be obtained from the institution offering the training or from the State department of education. Many States have reciprocity agreements that allow teachers who are certified in one State to become certified in another.

Secondary school teachers should be good at working with young people, knowledgeable in their special subject, and able to motivate students and to impart knowledge to them.

With additional preparation and certification, experienced teachers may be able to move into positions as school librarians, reading specialists, curriculum specialists, or guidance counselors. However, for most secondary school teachers, advancement takes the form of a higher salary rather than a different job. Relatively few teachers move into administrative or supervisory positions in a public school system. To do so usually requires at least 1 year of graduate education, several years of classroom teaching, and sometimes a special certificate.

Job Outlook

An oversupply of secondary school teachers has existed for many years. Nevertheless, job prospects have improved somewhat in recent years because the number of new graduates prepared to teach has dropped sharply. Science, mathematics, and computer programming teachers are—and may remain—in short supply because employers in private industry and government offer higher salaries to people trained in these fields. Some schools also report difficulty in finding enough teachers qualified in special education, vocational education, and bilingual education.

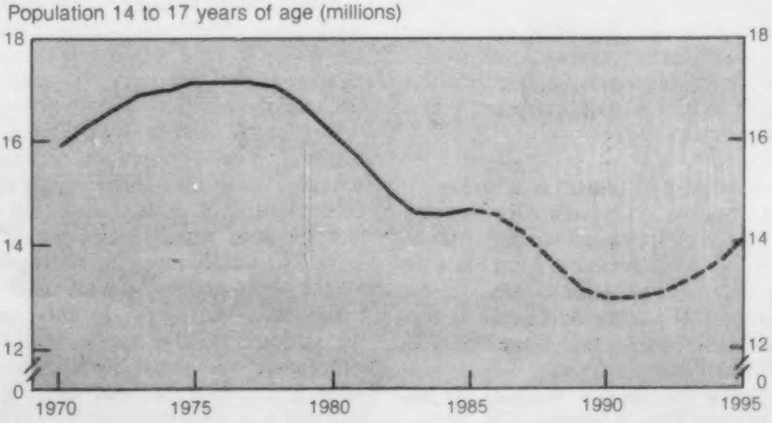
The primary sources of teacher supply are recent college graduates qualified to teach secondary school and former teachers seeking to reenter the profession. Although reentrants have experience in their favor, many schools prefer to hire new graduates who command lower salaries and whose training is more recent.

Employment of secondary school teachers is expected to decline throughout the 1980's and to start increasing during the early 1990's. By 1995, employment is projected to be slightly above the 1984 level. Pupil enrollment is the primary factor underlying the demand for teachers. The National Center for Education Statistics projects that enrollment in secondary schools will continue to decline through 1990. Enrollments will begin increasing after 1990, reflecting the rise in births beginning in the mid-1970's. Employment of teachers is expected to be somewhat higher than enrollment trends indicate because of anticipated lower pupil-teacher ratios. Nearly all openings for secondary school teachers will stem from the need to replace teachers who leave the profession.

In addition to teaching classes, secondary school teachers supervise study halls and homerooms, advise students, and attend meetings.

Although computers are being increasingly used in secondary schools,

The decline in the high school age population will not be reversed until the early 1990's.



SOURCE: Bureau of the Census

they are not expected to affect teacher employment, since their major use is for teaching computer science and for keeping records. Two other trends may affect teacher employment. Pressure from taxpayers to limit taxes and spending is likely to inhibit employment growth, while recent emphasis on improving the quality of education could stimulate it.

Earnings

According to the National Education Association, public secondary school teachers averaged $24,276 a year in 1984-85. Generally, salaries were highest in the Mid-Atlantic States and in the Far West.

Collective bargaining agreements cover an increasing number of teachers. In 1984, 33 States and the District of Columbia had laws that required collective bargaining in teacher contract negotiations, and an additional 9 States permitted such bargaining.

In some schools, teachers receive extra pay for coaching sports and working with students in extracurricular activities such as music, drama, or school publications. Some teachers earn extra income by working in the school system during summer sessions. Others hold summer jobs outside the school system.

Related Occupations

Secondary school teaching requires a wide variety of skills and aptitudes, including organizational, administrative, and recordkeeping abilities; research and communication skills; the power to influence, motivate, and train others; and creativity. Workers in other occupations requiring some of these aptitudes include: School administrators, counselors, trainers and employee development specialists, employment interviewers, librarians, personnel managers, public relations representatives, sales representatives, and social workers.

Sources of Additional Information

Information on certification requirements and approved teacher training institutions is available from State departments of education.

Information on teachers' unions and education-related issues may be obtained from:

American Federation of Teachers, 555 New Jersey Ave. NW., Washington, D.C. 20001.

General information on the teaching professions can be obtained from local or State affiliates of the National Education Association.

A list of colleges and universities accredited by the National Council for Accreditation of Teacher Education can be obtained from:

National Council for Accreditation of Teacher Education, 1919 Pennsylvania Ave. NW., Suite 202, Washington, D.C. 20006.

Adult and Vocational Education Teachers

(D.O.T. 075.127-010; 090.222; 097.227-010 and -014; 099.223, .227-014, -018, -026, and -030; 149.021; 150.027-014; 151.027-014; 151.027-014; 152.021; 153.227-014; 159.227; 166.227; 239.227; 621.221; 683.222; 689.222; 715.221; 740.221; 789.222; 806.227; and 919.223)

Nature of the Work

Vocational and adult education plays a significant role in postsecondary education. For millions of people, the road to a satisfying career begins when they enroll in a vocational education program. These programs prepare them for specific jobs that do not require a college degree, and cover such diverse fields as agriculture, construction trades, data processing, word processing, home economics, and health services. In contrast, adult or continuing education programs offer out-of-school adults a wide array of courses that do not specifically prepare them for an occupation. Instead, these programs are designed to help students improve the quality of their lives by improving their health, teaching them hobbies, and expanding their general knowledge. Course offerings range from basic education for school dropouts to aerobics to photography.

Adult and vocational education teachers generally teach courses related to their field of specialization. Teaching methods vary by subject, but usually teachers try to promote the students' active involvement in learning. For example, a technical school class in automotive repair may take place in a classroom equipped like an auto repair shop. Students learn by actually repairing cars, using all the tools and equipment used by experienced repairers. In this way, the students receive ample hands-on experience and learn by performing tasks and correcting mistakes.

Other courses, held in regular classroom settings, also stress learning by doing. An instructor teaching a course in real estate may give a lecture on Federal and State regulations, and then require the class to properly fill out all required forms and documents. Similarly, teachers of creative classes such as painting, photography, or pottery demonstrate the proper techniques before having the students apply them. The instructor then provides constructive criticism so the students can learn from their mistakes.

One of the most challenging areas in vocational and adult education is the Adult Basic Education (ABE) program, sponsored by the Federal Government. It provides instruction in reading, writing, and mathematics up to the eighth grade level for adults. This program also may prepare students to take the General Educational Development Examination (GED), which gives successful students the equivalent of a high school diploma. Another component of the ABE is teaching English to non-English-speaking people.

Adult basic education students may lack proper study habits, language skills, and self-confidence and require more attention and patience than other students. Teachers in this program must be able to deal with students at different levels of development. They must generate a positive reaction from the beginning, making the new student comfortable, developing trust, and helping students better understand their own needs and aims. For these teachers, the ability to listen is almost as important as the ability to teach. They must also select books, slides, games, or other materials that will make learning as meaningful and pleasurable as possible.

These teachers should be familiar with the community agencies and resources to which people may be referred when personal problems are beyond the scope of the program. Because many needy people are reluctant to seek out these programs, teachers must be aware of the need to recruit new participants. One of the best ways is to encourage participants to tell others about the adult basic education program.

In addition to time spent in the classroom, both adult and vocational education teachers must prepare lessons and assignments, grade papers, and do related paperwork on their own time. In addition, they may attend occasional faculty meetings.

Most important, they must stay abreast of developments in their area of expertise.

Working Conditions

Teaching involves extended periods of standing and talking and can be both physically and mentally tiring. Adult basic education teachers may experience emotional stress when dealing with students who are having personal problems, but they also can experience deep satisfaction when their students succeed.

Many adult and vocational education teachers work part time. Their hours depend on the number and type of courses they teach. Some part-time teachers spend no more than 3 hours a week in classes, while others spend as many as 15 hours. Many courses are offered at night or on weekends, and range from 1-day minisessions to courses of standard semester length.

Employment

Adult and vocational education teachers held about 256,000 jobs in 1984. Almost half work part time, a larger proportion than for other teachers. People teaching courses taken for credit, including adult basic education teachers and many vocational education teachers, usually work full time. Most of those who teach pottery, art, music, dance, and other noncredit courses work part time.

Adult and vocational programs are offered by many institutions, including vocational schools, technical institutions, career centers, colleges and universities, government agencies, business firms, labor unions, and religious organizations.

Training, Other Qualifications, and Advancement

Training requirements vary widely by State and by subject. For example, an instructor teaching masonry skills is only required to have experience in the field, whereas an instructor in horticulture may be required to have at least a master's degree and, in some States, a Ph.D. As a rule, teachers in the blue-collar trades must be licensed or must demonstrate that they have reached the journeyman level; teachers in the health fields must be registered or licensed; dance teachers usually are required to have completed formal training at a reputable dance academy; and photography teachers must submit a portfolio of their work. Other teachers usually are required to have several years' professional experience in their specialty.

Most States and the District of Columbia require adult basic education teachers to have a bachelor's degree from an approved teacher training program. In addition, some States require these teachers to be certified; certification requirements vary widely, but generally include courses in the psychological and emotional needs of adult students.

Adult and vocational education teachers should enjoy working with people and get real satisfaction sharing their knowledge with others. They also need good communication skills and the ability to motivate others.

For part-time teachers, advancement generally takes the form of higher pay. Full-time teachers, however, can often move up to administrative positions if they have proven administrative ability.

Job Outlook

Employment of adult and vocational education teachers is expected to grow about as fast as the average for all occupations through the mid-1990's as the demand for adult and vocational education programs continues to rise. Vocational education teachers will be needed to train young adults for jobs and to retrain older workers whose jobs have been eliminated due to changing technology and changes in business practices. The need to retrain older workers is expected to offset the decline in the number of young people 16 to 24 years of age, the age group most likely to enroll in a vocational program.

Also contributing to the demand is the increased participation by adults in part-time instruction. This participation has increased substantially during the past decade, reflecting the rise in the adult population and the growing emphasis on leisure time and self-improvement. As the baby-boom generation matures and the population gets older, demand for these programs is expected to continue to rise. The rising educational attainment of the work force also may have had an impact on the growth of adult basic education programs, as it has become more and more difficult to get a good job without basic academic skills. This trend also is likely to continue.

The major source of job openings for adult and vocational educational teachers will stem from the need to replace persons who leave the occupation. Because many of these teachers work part time, their attachment to the occupation is weak and turnover is quite high. Although most opportunities will be for part-time teachers, opportunities for full-time positions should be exceptionally good for persons qualified to teach computer technology, automotive mechanics, medical technology, and office skills.

Earnings

In 1984, the median hourly earnings of all adult and vocational education teachers were $9.70. The middle 50 percent earned between $6.75 and $14. The lowest 10 percent earned less than $4.75 while the top 10 percent earned more than $18 per hour. How-

Many adult and vocational education teachers work part time.

ever, earnings vary widely according to subject, academic credentials, experience, and region of the country.

According to the limited data available, adult basic education teachers had average earnings of between $11.50 and $17 an hour in 1984. Earnings of persons teaching data processing ranged between $8.50 and $15.50 an hour, and those of blue-collar trades instructors ranged between $7.50 and $14. Teachers of other subjects generally earned less.

Earnings also vary considerably by type of institution. For example, colleges and universities generally pay the highest salaries and vocational/technical institutes the lowest. Most institutions pay full-time and part-time teachers the same hourly wages, although part timers receive no fringe benefits.

Related Occupations

Adult and vocational education teaching requires a wide variety of skills and aptitudes, including organizational, administrative, and communication skills; the power to influence, motivate and train others; and creativity. Other occupations that use these aptitudes are other teachers, vocational and academic counselors, school administrators, public relations specialists, and employee development specialists.

Sources of Additional Information

Information on the Adult Basic Education program and certification requirements is available from State departments of education.

For information about vocational education teaching positions, contact the department of vocational education in your State.

General information on vocational education is available from:

American Vocational Association, 2020 N. 14th St., Arlington, Va. 22201.

For information on other adult education teaching positions, contact the parks and recreation department of your local government, local schools, colleges and universities, and organizations such as the YMCA and YWCA.

College and University Faculty

(D.O.T. 090.227-010)

Nature of the Work

Millions of people attend college for personal enrichment or for skills needed for a job. Although the majority are recent high school graduates, the number of older students on campus is growing. Many are homemakers preparing to enter or reenter the work force; others have returned to school to obtain courses for advancement in their present job or for a career change.

College and university faculty members provide instruction in particular fields of study to meet the needs of these students. Faculty members generally teach several different courses in the same field—freshman composition and 18th century English literature, for example. They may instruct undergraduates, graduate students, or both. Usually, more experienced faculty members teach the higher level classes.

College and university faculty may lecture in classrooms that seat hundreds of students, lead seminars for only a few students, or supervise students in laboratories. Some use teaching assistants who may lead discussion sections or grade exams. Closed-circuit television, computers, and other teaching aids are frequently used.

College faculty members keep up with developments in their field by reading current literature and participating in professional activities. They also conduct and publish the results of their own scholarly research. Some college faculty members may experience a serious conflict between their responsibilities to their students and the pressure to "publish or perish." Those at universities generally spend the most time doing research; those in 2-year colleges, the least.

In addition to preparation, instruction, and research, college and university faculty members may advise students and work with student organizations. Department heads also have administrative duties. Most faculty members serve on academic or administrative committees of the college or university.

Working Conditions

College faculty members generally have flexible schedules, dividing their time among teaching, research, advising, and administrative responsibilities. They may work staggered hours and teach classes at night. The normal teaching load usually is heavier in 2-year and community colleges, where less emphasis is placed on research and publication. College faculty have even greater flexibility during the summer and school holidays, during which they may conduct research, prepare course and teaching materials, teach short-term summer classes, travel, or pursue hobbies. College faculty also have the intangible reward of being exposed to new ideas and sharing in the growth and development of students.

Over 90 percent of all full-time college and university faculty work in institutions that have tenure systems (the assurance of continuing employment with freedom from dismissal without cause and due process). Nearly two-thirds of these faculty members are tenured. Under a tenure system, a faculty member usually receives 1-year contracts during a probationary period lasting at least 3 years and ordinarily no more than 7 years; some universities award 2- or 3-year contracts. After the probationary period, institutions consider faculty members for tenure. Declining enrollments and budgetary constraints, however, have made tenure increasingly difficult for faculty members to gain. Colleges and universities are turning to short-term contracts and to part-time faculty to save money.

Employment

College and university faculty held 731,000 jobs in 1984. About 2 out of 3 faculty members holding the rank of professor, associate professor, assistant professor, adjunct professor, lecturer, or instructor were full time, and almost 1 out of 3 was part time. Approximately 30,000 were full-time junior instructors. In addition, thousands of graduate students, employed as assistant instructors, teaching fellows, teaching assistants, or laboratory assistants, taught part time.

Public institutions, which constitute less than one-half of all colleges and universities, employ over 70 percent of all full-time instructional faculty. They employ about two-thirds of the full-time faculty in all universities and 4-year colleges, and 95 percent in all 2-year institutions.

Nearly one-third of full-time faculty teach in universities; almost one-half work in 4-year colleges; and over one-fifth teach in 2-year colleges.

A few part-time faculty work in more than one institution of higher education. Others are primarily employed outside of an academic setting—in government, private industry, or in nonacademic research. These people—sometimes referred to as "adjunct faculty"—may teach as little as one course a semester.

Training, Other Qualifications, and Advancement

The overwhelming majority of full-time college and university faculty are in four academic ranks: Professors, associate professors, assistant professors, and instructors. A small proportion are lecturers.

Most faculty members enter the profession as instructors and have at least a master's degree. Because competition for positions is so keen, many 4-year colleges and universities consider only doctoral degree holders for entry level academic appointments. At 2-year institutions, a doctorate may not be necessary.

Doctoral programs usually require 4 years or more of study beyond the bachelor's degree, including intensive research for a doctoral dissertation that makes an original contribution to the candidate's field of study. A working knowledge of one or more foreign languages (or computer languages) and, in many fields, advanced mathematical and statistical techniques are often required as well. Students should consider carefully their academic potential and motivation before beginning doctoral studies.

Advancement through the academic ranks in 4-year institutions usually requires a doctorate plus college teaching experience, even in institutions that hire master's degree holders as instructors.

Academic, administrative, and professional contributions affect advancement opportunities in this field. Research, publication, consulting work, and other forms of professional recognition all have a bearing on a college faculty member's chances of promotion.

College faculty need inquiring, analytical minds and a strong desire to pursue and disseminate knowledge. As teachers and researchers, they should be able to communicate well, both orally and in writing. And as models for their students, they should be dedicated to the principles of academic integrity and intellectual honesty. College faculty need to be open to new ideas—from their students, peers, and the nonacademic community.

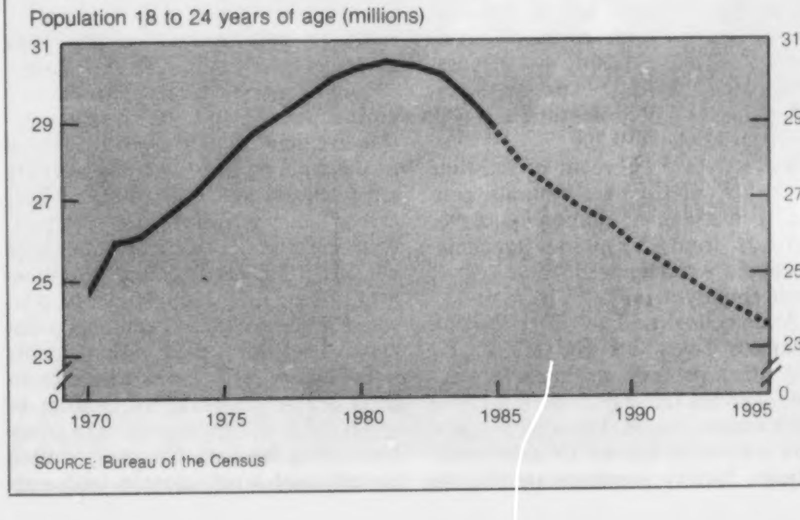
Job prospects for college teachers vary by academic field.

Job Outlook

Employment of college and university faculty is expected to decline through the mid-1990's. The basic factor underlying the demand for college faculty is enrollment. Enrollments, which peaked during the early 1980's, are expected to decline through the mid-1990's as the traditional college-age population decreases. A growing number of adults have entered college in recent years, many on a part-time basis, but adult enrollments are not expected to completely offset the decline in traditional-age college students. Employment opportunities may be better in community colleges that emphasize programs for adult learners. In general, however, fewer students will mean fewer college faculty members.

Because employment of college and university faculty will decline, job openings will result entirely from replacement needs. In any given academic institution, the number of va-

The college age population is expected to decline through the mid-1990's.



SOURCE: Bureau of the Census

cancies will be influenced by the age of current faculty, tenure patterns and policies, and retirement practices.

Competition for openings will be keen, particularly in prestigious institutions. Many graduates may have to accept part-time or short-term academic appointments that offer little hope of tenure. An increasing proportion of prospective college and university faculty members will have to seek nonacademic positions. And some persons holding graduate degrees may have to enter positions that have not previously required a master's degree or a Ph.D.

Some fields will offer brighter employment prospects for college faculty than others, of course. Departments that report shortages include engineering, computer science, physical sciences, and mathematics—areas that offer very attractive jobs outside the academic setting. Employment of college faculty is related to the nonacademic job market in other fields in another way: There is an "echo effect" as good job prospects in a field—engineering, for example—cause large numbers of students to sign up for courses, creating a demand for more teachers. On the other hand, a bad job market may cause a field temporarily to lose its popularity with college students—and reduce demand for faculty.

Earnings

Earnings vary widely according to faculty rank and type of institution. Faculty members in 4-year institutions earn higher salaries, on the average, than those in 2-year schools. According to a 1984-85 survey by the American Association of University Professors, salaries for all full-time faculty on 9-month contracts averaged around $31,000; professors, $39,900; associate professors, $25,300; assistant professors, $24,600; and instructors, $19,200.

Since over 86 percent of full-time faculty members have 9-month contracts, many have additional summer earnings from consulting, teaching, research, writing for publication, or other employment.

Some college and university faculty members enjoy benefits offered by few other professions, including tuition waivers for dependents, housing allowances, travel allowances, and paid sabbatical leaves. In many institutions, faculty members are eligible for a sabbatical leave after 6 or 7 years of employment.

Related Occupations

College and university faculty function both as teachers and researchers. They must have an aptitude for communicating information and ideas. Related occupations include: Trainers and employee development specialists, writers, consultants, lobbyists, and policy analysts. Their research activities are often similar to those of their colleagues in industry, government, and nonprofit research organizations.

Sources of Additional Information

Professional societies generally provide information on employment opportunities in their fields. Names and addresses of these societies appear in the statements on specific occupations elsewhere in the *Handbook*.

Counselors

(D.O.T. 045.107-010, -014, -018, -038, -042, .117-010; 090.107-010; and 169.267.026)

Nature of the Work

Counselors help individuals deal with personal, social, educational, and career problems and concerns. Their duties depend on the individuals or groups they serve and the settings in which they work. *School and college counselors* help students understand themselves better—their abilities, interests, talents, and personality characteristics—and help translate these into realistic academic and career options. They may run career information centers and career education programs. They may use tests or other tools to help students understand themselves and their options. High school counselors keep up to date on college admission requirements, entrance exams, and financial aid as well as job training in local trade or technical schools and apprenticeship programs. They help students find part-time and summer work and, for those who are not going to college, full-time jobs. They also help students with social, behavioral, and personal problems. They may deal with students individually, or, in cases where problems are widespread, as in drug or alcohol abuse, they may initiate group counseling sessions. Counselors often consult and work closely with parents, teachers, school psychologists, school nurses, and social workers. Elementary school counselors work with younger children, observing them during classroom and play activities and conferring with their teachers and parents in order to evaluate their strengths, problems, or special needs. They work to establish a home and school environment in which the child will learn, grow, and develop. *College counselors and student development specialists* provide a broad range of counseling services in 2-year community or junior colleges and 4-year colleges and universities. Counselors also work in college placement offices, dealing with students and alumni. These counselors are generally known as *college career planning and placement counselors*.

Rehabilitation counselors help physically, mentally, emotionally, or socially handicapped individuals to become self-sufficient and productive citizens. Rehabilitation counselors evaluate their clients' potential for employment and arrange for medical care, rehabilitation programs, occupational training, and job placement. To do this, they learn about their clients by talking with them, evaluating school and medical reports, and consulting with family members. They also confer with physicians, psychologists, and occupational therapists about the types of work their clients could perform. They then recommend an appropriate rehabilitation program and specialized training to help the disabled individual become more independent and more employable. Since employment success is an important goal of rehabilitation counseling, counselors keep in touch with employers about job openings and the training required.

Employment counselors help individuals make wise career decisions. Along with their client, they explore his or her education, training, work history, interests, skills, personal traits, and physical capacities. They may arrange for aptitude and achievement tests. These counselors may suggest specific employers and appropriate ways of applying for work, and give advice on resume writing and interviewing. They may contact employers for their clients. After placement, counselors follow up to determine if additional assistance is required.

Mental health counselors help individuals deal with a wide range of personal and social problems such as drug and alcohol abuse, family conflicts, including child and spouse abuse, suicide, work problems, criminal behavior, and problems of aging. They also counsel rape victims, individuals and families trying to cope with illness and death, and people with emotional problems. Mental health counselors work closely with other specialists, including psychiatrists, psychologists, clinical social workers, and psychiatric nurses.

Working Conditions

Rehabilitation and employment counselors generally work a standard 40-hour week. Self-employed counselors and those working in mental health and community agencies often work evenings to counsel clients who work during the day. College career planning and placement counselors may have to work overtime and irregular hours, especially during recruiting periods.

Most school counselors work the traditional 10-month school year with a 2-month vacation, although an increasing number are employed on 10 1/2- or 11-month contracts. They generally have the same hours as teachers.

Since privacy is essential to permit confidential and frank discussions with their clients, counselors usually have private offices.

Employment

Counselors held 152,000 jobs in 1984. Almost 2 out of 3 of these jobs were in educational services. Most of these were in secondary schools; some were in elementary schools and colleges and universities. State and local rehabilitation agencies and Veterans Administration rehabilitation programs and hospitals were major employers of rehabilitation counselors. Some worked in private rehabilitation agencies as well as in nonprofit organizations such as Goodwill Industries and Lighthouse for the Blind.

Counselors also worked in many types of public and private community mental health and social service agencies and organizations such as family (marriage) counseling services, halfway houses and homes for children and the handicapped, offender rehabilitation agencies, self-help organizations such as Alcoholics Anonymous and drug rehabilitation organizations, and in religious organizations providing similar services.

Training, Other Qualifications, and Advancement

Generally, a master's degree in student personnel counseling, student personnel services, rehabilitation counseling, counseling psychology, psychology, or a related field is required. In some cases, individuals with a bachelor's degree in psychology, sociology, counseling, or rehabilitation services are qualified, particularly if they have worked in related fields, such as social work, teaching, interviewing, job placement, psychology, or personnel.

Counselor education programs at the graduate level are available in close to 500 colleges and universities, usually in departments of education or psychology. One to two years of graduate study are usually required for a master's degree. Most graduate programs include supervised experience in counseling. Graduate courses include counseling theory and techniques, assessment and evaluation, individual and group counseling, career development information, and community resources. About 29 graduate counselor education programs are currently accredited by the Council for Accreditation of Counseling and Related Educational Programs.

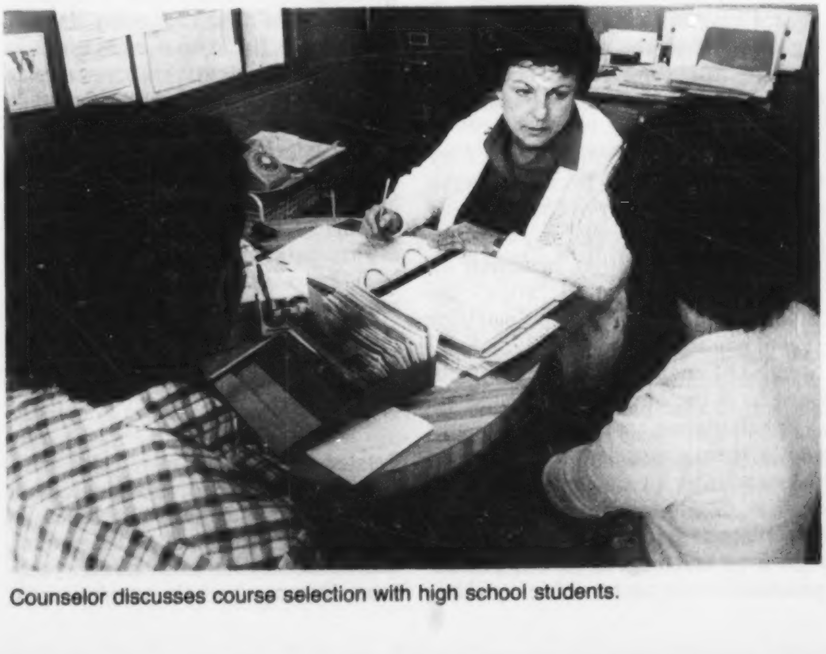
Many counselors are certified or licensed. The National Board for Certified Counselors examines professional credentials and conducts a national examination for those who wish to have the designation of "National Certified Counselor."

Most States require public school counselors to have both counseling and teaching certificates. Depending on the State, a master's degree in counseling and 2 to 5 years of teaching experience may be required for a counseling certificate. State departments of education can provide specific information.

Vocational and related rehabilitation agencies generally require a master's degree in rehabilitation counseling, counseling and guidance, or counseling psychology for rehabilitation counselor jobs. Some, however, may accept applicants with a bachelor's degree in rehabilitation services, counseling, psychology, or related fields. Experience in employment counseling, job development, psychology, education, and social work may be helpful.

Approximately 30 colleges and universities offer a bachelor's degree in rehabilitation services education. In 1985, the Council on Rehabilitation Education accredited 77 graduate programs in rehabilitation counseling. Usually, 2 years of study—including a period of supervised work experience—are required for the master's degree.

For jobs in most State vocational rehabilitation agencies, counselors must score competitively on a written examination and be evaluated by a board of examiners. Many employers



Counselor discusses course selection with high school students.

require rehabilitation counselors to be certified. To become certified, counselors must meet educational and experience standards established by the Commission on Rehabilitation Counselor Certification, and pass a written examination.

Some States require counselors in public employment offices to have a master's degree; others do not. Most counselors in State employment agencies have a bachelor's degree plus additional courses in guidance and counseling.

Mental health counselors generally have a master's degree or doctorate in mental health counseling, another area of counseling, or in psychology or social work. Mental health counselors can be certified by the National Academy of Certified Clinical Mental Health Counselors. A master's degree, a period of supervised internship, and a passing grade on an examination are required for certification. In addition, a number of States require a license for private practice.

Some employers provide an initial period of training for newly hired counselors or counselor trainees. Many agencies have work-study programs whereby employed counselors can earn graduate degrees. Professional counselors must meet continuing education requirements for certification and licensure. They do this through participation in graduate studies, workshops, institutes, and personal studies.

Persons interested in counseling should have a strong interest in helping others and the ability to inspire respect, trust, and confidence. They should be able to work independently or as part of a team.

School counselors may advance by moving to a larger school; becoming director or supervisor of counseling or pupil personnel services; or, with further graduate education, becoming an educational psychologist, vocational psychologist, school psychologist, or school administrator. Usually, educational or vocational psychologists must have the doctoral degree.

Rehabilitation, mental health, and employment counselors may advance to supervisory or administrative jobs in their agencies. Some counselors move into research, consulting work, or college teaching, or go into private practice.

Job Outlook

Overall employment of counselors is expected to grow about as fast as the average for all occupations through the mid-1990's. Most job openings will result from the need to replace counselors who transfer to other fields or leave the labor force.

Employment of school counselors—the largest specialty area—is expected to grow slowly. Pupil enrollment is the major factor affecting employment of school counselors. Elementary school enrollments are projected to increase substantially through 1995, but enrollments in secondary school, where most school counselors work, will not increase. The number of counselors in colleges and universities is expected to decline as college enrollments decrease.

Employment of rehabilitation and employment counselors, who work primarily for State and local governments, is expected to increase about as fast as the average for all occupations through the mid-1990's, while faster than average growth is expected for mental health counselors and others who work with individuals with personal and social problems such as marital or other family difficulties, alcoholism, drug abuse, and aging. Private practice, community and social service agencies, and the development of human resource and employee assistance programs in private business and industry are expected to be areas of growth.

Earnings

According to a recent survey, the average salary of school counselors in the 1984-85 academic year was $27,593. Salaries varied by size, grade level, and locality of the school. Average salaries were lowest in the Southeast and highest in the Far West. Salaries of rehabilitation, mental health, and employment counselors are usually somewhat lower than those of school counselors.

Some counselors supplement their income by part-time consulting or other work with private or public counseling centers, government agencies, or private industry.

Related Occupations

Counselors help people evaluate their interests, abilities, and disabilities, as well as help them deal with personal, social, academic, and career problems. Others who help people in similar ways include college and student personnel workers, teachers, personnel workers and managers, social workers, psychologists, psychiatrists, members of the clergy, occupational and physical therapists, training and employee development specialists, and equal employment opportunity/affirmative action specialists.

Sources of Additional Information

For general information about counselors, contact:

American Association for Counseling and Development, 5999 Stevenson Ave., Alexandria, Va. 22304.

For information on training programs accredited by the Council for Accreditation of Counseling and Related Educational Programs, contact:

Council for Accreditation of Counseling and Related Educational Programs, American Association for Counseling and Development, 5999 Stevenson Ave., Alexandria, Va. 22304.

For information on national certification requirements and procedures, contact:

National Board for Certified Counselors, 5999 Stevenson Ave., Alexandria, Va. 22304.

State departments of education can supply information on colleges and universities that offer training in guidance and counseling as well as on State certification and licensure requirements.

State employment service offices can supply information about their job opportunities and entrance requirements.

For information about rehabilitation counseling, contact:

National Rehabilitation Counseling Association, 633 So. Washington St., Alexandria, Va. 22314.

National Council on Rehabilitation Education, c/o Maddux O'Malley, Inc., 2921 Ermine Way, Farmers Branch, Tex. 75234.

A list of accredited graduate programs in rehabilitation counseling may be obtained from:

Council on Rehabilitation Education, 185 North Wabash St., Room 1617, Chicago, Ill. 60601.

For a list of federally funded programs offering training in rehabilitation counseling, contact:

Division of Resource Development, Rehabilitation Services Administration, U.S. Department of Education, 330 C St. SW., Washington, D.C. 20202.

For information on certification requirements for rehabilitation counselors, contact:

Commission on Rehabilitation Counselor Certification, 1156 Shure Dr., Suite 350, Arlington Heights, Ill. 60004.

For information on certification requirements for mental health counselors, contact:

National Academy of Certified Clinical Mental Health Counselors, 5999 Stevenson Ave., Alexandria, Va. 22304.

Librarians

(D.O.T. 100 except 100.367-018)

Nature of the Work

Librarians make information available to people. They serve as a link between the public and the millions of sources of information by selecting and organizing materials and making them accessible.

Library work is divided into two basic functions: User services and technical services. Librarians in user services—for example, reference and children's librarians—work directly with users to help them find the information they need. Librarians in technical services such as acquisitions librarians and catalogers acquire and prepare materials for use and deal less frequently with the public.

The size of the collection affects the scope of the job. In small libraries or information centers, librarians generally handle all aspects of the work. They select, purchase, and process materials; publicize services; provide reference help; supervise the support staff; prepare the budget; and oversee other administrative matters. In large libraries, librarians specialize in a single area, such as acquisitions, cataloging, bibliography, reference, circulation, or administration. Or they may handle special collections.

Building and maintaining a strong collection are essential activities in any library, large or small. *Acquisitions librarians* (D.O.T. 100.267-010) select and order books, periodicals, films, and other materials. They read book reviews and study publishers' announcements and catalogs to keep up with current literature. They confer with booksellers and seek advice from library users before making a final decision. A knowledge of book publishing and business acumen are important.

After materials have been received, other librarians prepare them for use. *Classifiers* (D.O.T. 100.367-014) classify materials by subject matter. They may skim through publications and assign classification numbers. *Catalogers* (D.O.T. 100.387-010) supervise assistants who prepare cards or other access tools that indicate the title, author, subject, publisher, date of publication, and location in the library. Many libraries have computerized their acquisition and cataloging functions. This has resulted in faster and greater availability of materials to the library user.

Bibliographers (D.O.T. 100.367-010), who usually work in research libraries, compile lists of books, periodicals, articles, and audiovisual materials on particular subjects. They also recommend materials to be acquired in subject areas with which they are familiar. *Special collections librarians* (D.O.T. 100.267-014) collect and organize books, pamphlets, manuscripts, and other materials in a specific field, such as rare books, genealogy, or music. They may prepare reports and exhibits to inform scholars and other researchers about important additions to the collection.

Librarians are also classified according to the type of library in which they work: Public libraries, school library/media centers, academic libraries, and special libraries.

Public librarians serve people of all ages and from all walks of life, including persons who, because of physical handicaps, cannot use conventional print materials. The professional staff of a large public library system includes the chief librarian, an assistant chief, and division heads who plan and coordinate the work of the entire system. The system also may include librarians who supervise branch libraries and specialists in acquisitions, cataloging, special collections, and user services.

Some public librarians work with specific groups of readers. *Children's librarians* (D.O.T. 100.167-018) find materials children will enjoy and show children how to use the library. They may plan and conduct special programs such as story hours or film programs. They often work with school and community organizations. *Adult services librarians* handle materials suited to the needs and interests of adults. They may help to conduct education programs, such as community development, public affairs, creative arts, problems of the aging, and home and family. *Young adult librarians* (D.O.T. 100.167-034) help junior and senior high school students select and use books and other materials. They may organize programs of interest to young adults, such as book or film discussions or concerts of recorded music. They also may coordinate the library's work with school programs. *Community outreach librarians* and *bookmobile librarians* (D.O.T. 100.167-014) develop library services to meet the needs of special groups within the community. They might arrange for materials to be brought to a migrant labor camp, an inner city housing project, or a nursing home, for example.

School librarians (D.O.T. 100.167-030) teach students how to use the school library/media center. Working with teachers and media specialists, school librarians familiarize students with the library's resources. They prepare lists of materials on certain subjects and help select materials for school programs. They also select, order, and organize materials. The library/media center is viewed as an integral part of the school's overall instructional program, and many school librarians work closely with classroom teachers in curriculum development. They assist teachers in developing study units and sometimes participate in team teaching.

In large high schools and in many community colleges, the media center's collection of films, tapes, cassettes, records, and other materials is maintained by a *school library media specialist* (D.O.T. 100.167-030) or an *audiovisual librarian* (D.O.T. 100.167-010). Media center professionals also develop audiovisual materials and work with teachers on curriculum.

Academic librarians serve students, faculty members, and researchers in colleges and universities. They work closely with members of the faculty to ensure that the library has reference materials required for the courses offered. They also maintain the quality of research collections.

Special librarians (D.O.T. 100.167-026) work in information centers or libraries maintained by government agencies and corporations such as pharmaceutical companies, and banks, as well as by law firms, advertising agencies, museums, professional associations, medical centers, and research laboratories. They build and arrange the organization's specialized information resources, usually limited to subjects of particular interest to the organization. Special librarians may conduct literature searches, compile bibliographies, or prepare abstracts.

A growing number of libraries are tied into remote computer data bases through their computer terminals. This makes it less important than it once was for a library to own the materials its users want, since they can be accessed remotely by computer or sent by facsimile machines. More libraries are also maintaining their own computerized data bases. These libraries may employ information scientists (D.O.T. 109.067-010) who design information storage and retrieval systems and develop procedures for collecting, organizing, interpreting, and classifying information.

Working Conditions

Libraries generally are busy, demanding, even stressful places to work. Contact with people, which often is a major part of the job, can be taxing. Physically, the job may require much standing, stooping, bending, and reaching.

Librarians typically work a 5-day, 35- to 40-hour week. Public and college librarians may work some weekends and evenings. School librarians generally have the same workday schedule as classroom teachers and similar vacation schedules. A 35- to 40-hour week during normal business hours is common for special librarians.

Librarians answer requests for information.

Employment

Librarians held 155,000 jobs in 1984; in addition, audiovisual specialists held 7,800 jobs in library/media centers. Most of the librarian jobs were in school libraries; the rest were in public, academic, and special libraries. A small number of librarians served as consultants or administered State and Federal library programs.

Training, Other Qualifications, and Advancement

A master's degree in library science (M.L.S.) is necessary to obtain an entry level professional position in most public, academic, and special libraries. About 120 schools offered such degrees in 1984. However, most employers prefer graduates of 1 of the 59 library education programs in the United States accredited by the American Library Association. Educational preparation for school librarianship is more diverse, reflecting the considerable differences among the States in standards and certification requirements for public school librarians.

Most graduate schools of library science require graduation from an accredited 4-year college or university and good grades. A broad undergraduate background, with well-defined major and minor areas of study, is appropriate preparation for graduate library education. Some library schools require a reading knowledge of at least one foreign language.

A typical graduate program in library science includes basic courses in the foundations of librarianship, including the history of books and printing, intellectual freedom and censorship, and the role of libraries in society. Other basic courses cover material selection and processing; reference tools; and user services. Advanced courses are offered in such areas as resources for children or young adults; classification, cataloging, indexing, and abstracting; library administration; and library automation. Because virtually all aspects of routine library operation are subject to automation, many library schools encourage students to take courses in computer and information science.

The master of library science program provides a general, all-round preparation for library work, but some people specialize in a particular area such as archives, media, or library automation. A Ph.D. degree in library science is advantageous for a college teaching position or for a top administrative post, particularly in a college or university library or in a large library system.

In special libraries or research libraries, a master's degree, doctorate, or professional degree in the appropriate subject specialization is highly desirable. And in academic libraries, an advanced degree may be essential for promotion to a senior level position.

State certification requirements for public school librarians vary widely. Most States require that school librarians be certified as teachers. A degree in library science may not be required, for, in many schools, the library has become the "learning resources center" and is staffed by media personnel with a variety of educational backgrounds. Although some media professionals have a bachelor's or master's degree in library science, others have a degree in media resources, educational technology, or audiovisual communications. State departments of education can provide information about specific requirements.

Some States require certification of public librarians employed in municipal, county, or regional library systems. State library agencies can provide information about these requirements.

In the Federal Government, which currently hires about 90 librarians a year, beginning positions require completion of a 4-year college course and a master's degree in library science, or demonstration of the equivalent in experience and education by a passing grade on an examination.

Because there are many qualified jobseekers, employers in some localities may require some experience for what used to be entry level positions. Graduates who have participated in internship programs and work-study programs or who have worked part time may have an employment advantage over other new graduates.

Experienced librarians may advance to administrative positions. A master's degree in business or public administration may help to obtain such positions.

Job Outlook

Employment of librarians is expected to grow more slowly than the average for all occupations through the mid-1990's. Most job openings will result from the need to replace librarians who transfer to other fields, retire, or leave the occupation for other reasons.

The demand for individuals with library skills outside traditional library settings is expected to help ease the tight job market for librarians. Nontraditional library settings such as bibliographic cooperatives, regional information networks, and information search services are expected to be good places of employment. These settings employ systems analysts, database specialists, managers, and researchers. Some of these jobs require a knowledge of both libraries and computers; others, only a knowledge of libraries. Furthermore, the number of library school graduates, which has been declining since the mid-1970's, may continue to decrease slowly. Therefore, the oversupply could abate, and employment prospects brighten.

Employment in public libraries, like government employment in general, is expected to grow slowly. Faced with tighter operating budgets, many libraries are expected to hire fewer additional librarians.

Employment of academic librarians is expected to decline, a reflection of the overall decline in college enrollments expected through the mid-1990's. The situation will vary from institution to institution, however.

In school libraries, a large sector, slow employment growth is foreseen, overall. Although elementary school enrollments are increasing, secondary school enrollments will remain virtually unchanged during the 1984-95 period.

Opportunities should be favorable for librarians with specialized knowledge in scientific and technical fields including medicine, law, business, engineering, and the physical and life sciences. These jobs are available in special libraries and research libraries, for the most part. Individuals with a command of a foreign language or a background in cataloging or in working with children should also find better job opportunities. Individuals skilled in computerized library systems will also be in demand, because of the widespread use of computers to store and retrieve information and to handle routine operations such as ordering, cataloging, and circulation control.

Although more and more libraries are automated and librarians have to know how to use a computer, the judgment and knowledge of a professional librarian will still be needed.

Information management outside the traditional library setting, a rapidly developing field, is expected to offer many employment opportunities for library school graduates and practicing librarians with backgrounds in information science and library automation. Private industry, consulting firms, and information brokers who market information all need qualified people to set up and maintain information systems.

Earnings

Salaries of librarians vary by the individual's qualifications and the type, size, and location of the library.

Starting salaries of graduates of library school master's degree programs accredited by the American Library Association averaged $18,791 in 1984, and ranged from $17,232 in public libraries to $20,423 in school libraries. Beginning salaries of new library school graduates in special libraries averaged $20,233. Experienced school librarians averaged $23,173 during the 1983-84 school year, according to the Educational Research Service. The average salary for special librarians was $28,421 in 1984. The median salary for librarians in college and university libraries was $26,000. Librarians in the Federal Government averaged about $31,530 in 1984.

Related Occupations

Librarians play an important role in the transfer of knowledge and ideas by providing people with access to the information they need and want. Jobs requiring similar analytical, organizational, and communicative skills include archivists, information scientists, museum curators, publishers' representatives, research analysts, information brokers, and records managers.

Sources of Additional Information

Information on librarianship, including a listing of accredited education programs and information on scholarships or loans, may be obtained from:

American Library Association, 50 East Huron St., Chicago, Ill. 60611.

For information on a career as a special librarian, write to:

Special Libraries Association, 1700 18th St., NW., Washington, D.C. 20009.

Material about a career in information science may be obtained from:

American Society for Information Science, 1010 16th St. NW., Washington, D.C. 20036.

Information on graduate schools of library and information science can be obtained from:

Association for Library and Information Science Education, 471 Park Lane, State College, Pa. 16803.

Information on Federal assistance for library training is available from:

Center for Libraries and Education Improvement, U.S. Department of Education, 400 Maryland Ave. SW., Brown Bldg., Room 613, Washington, D.C. 20202.

Those interested in a position as a librarian in the Federal service should write to:

Office of Personnel Management, 1900 E St. NW., Washington, D.C. 20415.

Information concerning requirements and application procedures for positions in the Library of Congress may be obtained directly from:

Personnel Office, Library of Congress, Washington, D.C. 20540.

State library agencies can furnish information on scholarships available through their offices, requirements for certification, and general information about career prospects in the State. Several of these agencies maintain job "hotlines" which report current openings for librarians in the State.

State boards of education can furnish information on certification requirements and job opportunities for school librarians.

Archivists and Curators

(D.O.T. 101; 102 except .261-014 and .367-010; 109 except .067-010 and .137-010)

Nature of the Work

Curiosity about the past seems to be part of human nature. Many persons study a previous era for the sake of knowledge alone. Others want to gain more insight into some aspect of today's world. And some hope to use this knowledge as a clue to the future. Whatever the purpose or subject—the development of armaments. changing fashions, numismatic collections, art collections, historic properties, collections of Presidential papers, or the course of subatomic research—archivists and curators attempt to present the information in an attractive, yet instructive, manner.

Archivists and curators search for, acquire, assemble, catalog, restore if necessary, exhibit, maintain, and store items of interest. These items may be almost anything—historical documents, corporation records, works of art, stamp collections, mineral collections, maps, movies, medical and scientific instruments, plants, arboreta, animals, buildings, or battle sites. The collection may be of special interest to children, hobbyists, scientists, researchers, corporations, inhabitants of a specific locality, history buffs, or an ethnic group, or of interest to the public at large.

Archivists determine what portion of the vast amount of information produced by government agencies, corporations, educational institutions, and other organizations should be made part of a historical record and sometimes an exhibit. Archivists may modify existing classification systems to facilitate retrieval of subject matter for future use. They determine the form of storage—for example, original documents, microfilm, microfiche, or magnetic tape. Since substantial amounts of information are now being stored on tape, basic knowledge of computer language and usage is increasingly useful to archivists.

Archivists may serve in an advisory or research capacity for their employers or for scholars, scientists, journalists, and various agencies and institutions. This may require expertise in a specific discipline or knowledge of the political, economic, social, and military history of a period.

Curators determine the form and nature of the collection of items to be exhibited, often in consultation with museum directors, other curators, researchers, and specialists. From initial research to final exhibition, curators oversee and, in smaller museums, personally undertake many activities.

Curators select the appropriate number and kind of items to comprise the collection. Curators may acquire items through purchases, gifts, fieldwork, intermuseum loans, or from the museum's own inventory with the help of the registrar and collections manager. (The registrar is responsible for the movement of items—their packing, insurance, and cataloging—in and out of the museum. The collections manager keeps track of items in the museum's inventory.)

In preparation for an exhibition, curators work with technicians and specialists such as museum technicians, exhibit specialists, educators, and related personnel to plan and prepare the form and contents of the exhibit. Conservation technicians, restorers, and armorer technicians restore the exhibit items—old sculptures, buildings, or artifacts from another era—as closely as possible to their original condition. The restoration may require substantial historical and archeological research by the curator and research associates and consultations in the art shops and laboratories where restoration activities take place.

An attractive and educational exhibition may result in good attendance, favorable public relations, and increased revenue for the museum.

Curators may train or help establish museum education programs for museum attendants and docents (unpaid volunteers) who lead guided tours to enhance viewers' appreciation and understanding of exhibits. Many volunteers are women; increasing numbers are students hoping to acquire valuable experience. Without these volunteers, many large museums would have to restrict their activities and many small museums would probably close.

In large museums, curators may divide their time between meetings with museum administrators such as museum directors, budget officers, and program directors to help formulate policy, and meetings with assistant curators, conservators, and department heads to help implement the museum's programs. In small museums, their responsibilities may include the functions of most, if not all, museum occupations.

Working Conditions

Archival work is sedentary and quiet. The work can be tedious, painstaking, and require meticulous attention to detail. Many archivists work alone, and most work in offices with only one or two other persons. This is true even for large employers such as governments or universities. There is little contact with the public, except when working in a library. Sometimes, strong interest in an archival display may require contact with the press and response to public inquiries. Teaching or research duties often result in interpersonal contact through attendance at classes and meetings or travel to collect information.

Curators also usually work in a quiet office environment. However, working conditions vary depending upon the type and size of museum.

In art museums with typically small items, little physical activity is required. Working in museums with collections of large objects such as tapestries and animal specimens may be more physically demanding. Overseeing collections in botanical gardens and other outdoor museums may require substantial walking.

In small museums with generally limited budgets, new items can be acquired only ocasionally, but in large museums with more funds at their disposal, curators may travel extensively to add to the collection. They might visit a private collector, a commercial establishment, or another museum, or even participate in an archeological expedition or botanical exploration. Maintenance and restoration activities also may require travel—to studios where paintings are being restored or laboratories where animal specimens are being prepared for display. Curators working as administrators of distant historic sites may also travel. In some cases, these administrators temporarily live at—as in the case of a historic house—or near the site.

Employment

Archivists and curators held an estimated 11,000 jobs in 1984. About 40 percent were in Federal, State, and local government agencies. About 30 percent were in private museums; most of the remainder were in universities, colleges, and libraries.

In the Federal Government, most archivists are employed in the National Archives and Records Administration, while others are employed by the Department of Defense to manage military archives. Most museum curators in the Federal Government are employed in the Smithsonian Institution, in the military museums of the Department of Defense, and in archeological and other museums managed by the Department of Interior. All State governments have archival or historical records sections, and many employ archivists. Both State and local governments have numerous historical museums, parks, and zoos employing curators.

A small but growing number of large corporations have established archival or records centers, employing archivists to manage the growing volume of historical records required by law or necessary to the firms' operations. Religious and fraternal organizations, professional associations, and research firms also increasingly employ archivists and curators.

Over 10 percent of all archivists and 20 percent of all curators work part time, primarily in small archival centers and museums.

Training, Other Qualifications, and Advancement

Employment as an archivist or curator generally requires graduate training and substantial practical or work experience. Many archivists and curators work in archives, museums, or libraries while completing their formal education.

Most archivists have at least one master's degree, and many have a doctorate or second master's degree in library science. Archivists commonly earn undergraduate and graduate degrees in history, economics, or related fields, including courses in archival or library science. Of the more than 70 institutions of higher learning offering courses or practical training in archival science, about 30 offer the master's degree and over 10 offer the doctorate.

Continuing education is very important. Workshops sponsored by the National Archives and Records Administration include: Establishing archives; problems of acquisition—for example, appraisal and forgeries; problems relevant to access and security of information; and administration—for example, budgeting, program planning, and resource allocation. Meetings and conferences sponsored by the Society of American Archivists and other archival associations enable archivists to keep up with developments in their field such as the increasing use of computers to store and access information.

Archivists should have good eyesight, since information to be stored may be printed matter, handwritten manuscripts, or visual materials such as photographs and film, and legibility may be poor. The ability to read rapidly to extract the pertinent information from large amounts of data is required. Archivists also must be able to effectively organize large amounts of information and write clear, succinct instructions for its efficient retrieval and use.

Archival units usually are very small, and promotion opportunities are limited. Advancement generally is through transferring to a larger unit. When the archival activity is ancillary to other activities—for example, in a library or a museum—archivists may become librarians or manuscript curators.

The minimum requirements for employment as a curator, even in small museums, are a bachelor's degree in museum studies (museology) or in a discipline reflecting the museum's specialty—for example, art, anthropology, or archeology—and experience in museum activities such as art restoration and exhibit design. For some positions, curators gain permanent employment status after completing an internship including full-time museum work supplemented by self-paid courses in museum practices. In large museums, a master's degree in museum studies or a related subject has become the minimum educational requirement; employers prefer applicants with a doctorate. For some positions, experience may be substituted for an advanced degree.

Some curators oversee art restoration activity.

About 60 institutions of higher learning offer undergraduate courses in museum studies, while nearly 40 grant the bachelor's degree and over 90 grant the master's degree.

Curatorial positions often require knowledge in a number of fields. One's academic background should include courses in social sciences—such as history and economics—and in life sciences—such as botany and zoology. For historic and artistic conservation activities, courses in chemistry, physics, and in painting and other crafts are desirable. Since curators—particularly those in small museums—may have administrative and managerial responsibilities, courses in administration, budget, collections management, fund raising, and public relations also are recommended.

Curators must be flexible because of their wide variety of duties. A good aesthetic sense is helpful in the design and presentation of exhibits. Manual dexterity may be helpful when supervising or collaborating with craft workers in the erection of exhibits or restoration of various objects. The ability to maintain good personal relations is important in coordinating the efforts of museum personnel. Public relations skills are valuable in increasing museum attendance and in finding sponsors for financial backing.

Continuing education is also very important for curators. To keep abreast of improvements in museum operating techniques, they attend conferences and meetings sponsored by the Association of American Museums and other museum associations. They monitor developments in museum activities, such as restoration techniques, by attending workshops sponsored by large museums such as the Smithsonian Institution.

Curators usually advance by acquiring a position in a larger museum. Earning an advanced degree is very important, as is the publication of articles and reports in learned journals. In very large museums, curators can advance to administrative positions such as program planner or museum director.

Job Outlook

Employment of archivists and curators is expected to increase more slowly than the average for all occupations through the mid-1990's. Little expansion of governmental archival and museum activities is expected. A reversal of the decline in funding of private museums is not anticipated.

Archivists can improve their job opportunities by including courses in library science in their graduate curricula. Graduates with doctoral degrees will be offered the most responsible, best paying jobs. Some employment opportunities will arise in related fields such as librarian, records manager, collection manager, and manuscript curator. However, employment in these fields also is expected to grow relatively slowly.

Competition for curatorial positions will intensify because of an increasing oversupply of well-trained applicants. Many candidates may have to work part time, as an intern, or even as a volunteer in an assistant curatorial or research associate position after completing their formal education. For others, substantial work experience in collection management, exhibit design, or restoration will be necessary before permanent curatorial status is acquired.

Earnings

Earnings of archivists and curators vary considerably depending upon the type and size of the employer. For example, salaries of archivists in the Federal Government are, on the average, much higher than those of archivists employed in religious organizations. Salaries of curators in large, well-funded museums may be several times higher than those in small museums. Natural history museums tend to pay the highest salaries; general history museums, the lowest. Generally, Federal salaries are higher than those in State governments which, in turn, are higher than in local governments.

Starting salaries in the Federal Government depend upon the applicant's degree and experience. In 1985, inexperienced archivists with a bachelor's degree started at $14,400 while those with experience started at $17,800. Applicants with a master's degree started at $21,800. Curators with a bachelor's degree and experience or with a master's degree started at $21,800. Applicants with a master's degree and experience or with a doctorate started at either $26,400 or $31,600. Archivists and curators employed by the Federal Government averaged about $34,500 a year in 1984.

Related Occupations

Archivists' and curators' interests in preserving and displaying documents and objects are shared by anthropologists, arborists, archeologists, artifacts conservators, botanists, ethnologists, folklorists, genealogists, historians, horticulturists, information specialists, librarians, paintings restorers, records managers, and zoologists.

Sources of Additional Information

Information about careers as an archivist and schools offering courses in archival science is available from:

Society of American Archivists, 600 South Federal St., Suite 504, Chicago, Ill. 60605.

For general information about careers as a curator and schools offering courses in curatorial science, contact:

American Association of Museums, 1055 Thomas Jefferson St. NW., Washington, D.C. 20007.

For information about curatorial careers in parks, botanical gardens, and museums, contact:

American Association of Zoological Parks and Aquariums, Oglebay Park, Wheeling, West Va. 26003.

American Association of Botanical Gardens and Arboreta, P.O. Box 206, Swarthmore, Pa. 19081.

For information about conservation and preservation careers, contact:

American Institute for Conservation of Historic and Artistic Works, 3545 Williamsburg Lane NW., Washington, D.C. 20008.

National Trust for Historic Preservation, Office of Personnel Administration, 1785 Massachusetts Ave. NW., Washington, D.C. 20036.

Health Diagnosing and Treating Practitioners

Health practitioners diagnose, treat, and strive to prevent illness and disease. While all of them practice the art of healing, they differ in methods of treatment and areas of specialization. *Physicians*—both doctors of medicine and doctors of osteopathy—prescribe medications, exercise, proper diet, and surgery. Manipulation of muscles and bones, especially the spine, is the primary form of treatment given by *chiropractors*. *Optometrists* specialize in eye care and *podiatrists* treat foot diseases and deformities. *Dentists* emphasize not only the treatment but the prevention of problems associated with the teeth and gums. *Veterinarians* treat animals and inspect meat, poultry, and other food as part of public health programs.

Among the health practitioners whose work is described in this section of the *Handbook*, the most numerous are physicians, who held 476,000 jobs in 1984. The other practitioner occupations are much smaller, as the following tabulation shows:

Physicians (M.D.'s and D.O.'s)	476,000
Dentists	156,000
Veterinarians	40,000
Chiropractors	31,000
Optometrists	29,000
Podiatrists	11,000

Training to become a health practitioner is much more rigorous than training for most other professional occupations, but practice also offers unusual rewards. Incomes of health practitioners greatly exceed the average and generally are higher than those of other professional workers with similar years of graduate education. Furthermore, health practitioners enjoy great prestige within the community, and most derive considerable satisfaction from knowing that their work contributes directly to the well-being of others.

All health practitioners must have the ability and perseverance to complete the years of study required. They should be emotionally stable, able to make decisions in emergencies, and have a strong desire to help the sick and injured. Sincerity and an ability to gain the confidence of patients also are important qualities.

Among these six health practitioner occupations, minimum training requirements vary from 6 to 9 years of postsecondary education. After college, prospective physicians must complete 3- or 4-year programs of medical education, followed by at least 1 year of graduate training in a hospital (residency or internship). Physicians who specialize, and most M.D.'s do, spend several years in training after their residency to qualify for specialty board examinations. Two years of college are required for entry to the 4-year chiropractic schools. Optometrists, podiatrists, and veterinarians all must complete a minimum of 2 years of college before beginning the 4-year program.

Occupational licensing is a distinctive feature of the health sector. The right to practice medicine, dentistry, nursing, pharmacy, and several other professions—and the right to call oneself a physician, dentist, nurse, or pharmacist—is regulated by law. Each of the 50 States has legislation governing the kinds of tasks that may be performed by a given health professional and specifying the training and proof of competence necessary for practice. Complementing the occupational licensure laws is a system of granting professional credentials, in which associations and other nongovernmental bodies attest to an individual's competence through certification or registration.

The employment outlook for health practitioners is expected to remain favorable through the mid-1990's, but the market is changing as supply overtakes demand. The physician shortage identified during the 1960's and early 1970's has vanished as a result of legislative measures designed to expand supply. In fact, medical school graduates are finding it unexpectedly difficult to secure the residency of their choice and—later on—to start a practice. Established practitioners report that they are seeing fewer patients than they would like.

Nonetheless, physicians in private practice generally work 60 hours a week or more, and their earnings potential exceeds that in most other occupations. In the years ahead, demand for their services will continue to grow, for the population is increasing—especially the number of older people, who are relatively heavy users of health care. Moreover, rural communities and inner city neighborhoods remain underserved.

The American health care system is likely to change in a number of ways in the years ahead as a result of efforts to control the very rapid increase in health care costs. For example, practice patterns are likely to change. Solo practice is already beginning to give way to group practice and a variety of salaried arrangements, and this trend is likely to accelerate as more and more young practitioners accept salaried positions. Salaried positions for physicians are found in health maintenance organizations; multispecialty group practices; ambulatory, emergency, critical care, and subspecialty procedure facilities; the Armed Forces and the Veterans Administration; and in other institutional settings. Especially in areas already well served with practitioners, new graduates appear willing to sacrifice traditional practice patterns (and income potential) in favor of ensured earnings, regular hours, and protection from some of the more stressful elements of practice.

Changes in the employment situation of physicians will affect other health practitioners, and competition for patients is already evident. Some specialists are moving into general practice as referrals for specialty work fall off. Competition appears to be mounting between physicians, on the one hand, and other providers, including optometrists, podiatrists, chiropractors, clinical psychologists, physical therapists, and nurse midwives, on the other. In dentistry, the ample supply of dentists may dampen prospects for dental auxiliaries (hygienists and assistants). However, relations among the health occupations are complex, and the net effect of an abundance of physicians and dentists is uncertain. For more detailed information about the outlook in individual practitioner occupations, see the statements that follow.

Chiropractors

(D.O.T. 079.101-010)

Nature of the Work

Chiropractic is a system of treatment based on the principle that a person's health is determined largely by the nervous system, and that interference with this system impairs normal functions and lowers resistance to disease.

Chiropractors take patient histories, conduct physical examinations, and give treatments for illness and injury. Because of the emphasis on the spine and its position, most chiropractors use X-rays to help locate the source of patients' difficulties. Chiropractors treat patients primarily by manual manipulation (adjustments) of parts of the body, especially the spinal column. In addition to manipulation, chiropractors use water, light, massage, ultrasound, electric, and heat therapy. They also prescribe diet, supports, exercise, and rest. Most State laws specify the types of supplementary treatment permitted in chiropractic. Chiropractors do not prescribe drugs or surgery.

Chiropractors treat patients primarily by manually adjusting the spine.

Working Conditions

Almost all chiropractors work in private offices that are clean and comfortable. The average workweek is about 40 hours, usually including some evening and weekend time to accommodate patients who work. Because most chiropractors are self-employed, they can set their own hours.

Employment

Chiropractors held about 31,000 jobs in 1984. About 95 percent of active chiropractors were in private practice; about 70 percent of these were in solo practice—that is, they had no partners. Only 8 percent practiced in groups of three or more practitioners. Some were salaried assistants of established practitioners or worked for chiropractic clinics. A small number taught or conducted research at chiropractic colleges.

Chiropractors often locate in small communities—about half work in cities of 50,000 inhabitants or less.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia regulate the practice of chiropractic and grant licenses to chiropractors who meet educational requirements and pass a State board examination. Many States have reciprocity agreements that permit chiropractors already licensed in another State to obtain a license without taking an examination.

The type of practice permitted (scope of practice) and the educational requirements for a license vary considerably from one State to another, but in general, State licensing boards require successful completion of a 4-year chiropractic course following 2 years of college. Thirty-eight State boards recognize only academic training in chiropractic colleges accredited by the Council on Chiropractic Education. Some States require specific college courses such as English, chemistry, biology, or physics. Several States require that chiropractors pass a basic science examination. The National Board of Chiropractic Examiners' test given to chiropractic students is accepted by 48 State boards in place of a State examination. To maintain licensure, 41 States require that chiropractors complete a specified number of hours of continuing education each year to remain current in the field.

In 1984, 9 of the 15 chiropractic colleges in the United States were fully accredited by the Council on Chiropractic Education; 5 others were recognized candidates working toward accreditation. All chiropractic colleges require applicants to have a minimum of 2 years of undergraduate study, including courses in English, the social sciences, chemistry, biology, physics, and mathematics.

Chiropractic colleges emphasize courses in manipulation and spinal adjustments. Most offer a broader curriculum, however, including subjects such as physiotherapy and nutrition. During the first 2 years, most chiropractic colleges emphasize classroom and laboratory work in subjects such as anatomy, physiology, and biochemistry, while the last 2 years stress clinical experience. Students completing chiropractic education earn the degree of Doctor of Chiropractic (D.C.).

Chiropractic requires keen observation to detect physical abnormalities and considerable hand dexterity but not unusual strength or endurance. Persons desiring to become chiropractors should be able to work independently and handle responsibility. The ability to work with detail is important. Sympathy and understanding are desirable qualities for dealing effectively with patients.

Newly licensed chiropractors usually seek to set up a new practice, purchase an established one, or enter into partnership with an established practitioner. Because of the financial investment necessary to open and equip an office, some take salaried positions with established chiropractors to acquire the experience and the funds needed.

Job Outlook

Job opportunities for chiropractors through the mid-1990's will stem from employment growth that is expected to be faster than the average for all occupations and also from the need to replace experienced chiropractors who leave the profession.

Demand for chiropractic is related to the ability of patients to pay for services, either directly or through health insurance, and to public acceptance of the profession, which appears to be growing. At present, newly graduated chiropractors are entering practice with little difficulty. However, the number of graduates from chiropractic colleges has increased fourfold since the early 1970's, and enrollments are expected to continue to grow. As more students graduate, new chiropractors may encounter competition establishing a practice in areas where other practitioners already are located.

Earnings

In chiropractic, as in other types of independent practice, earnings are relatively low in the beginning. From the limited data available, new graduates who worked as associates to established practitioners earned about $15,000 a year in 1984. Experienced chiropractors averaged about $60,000, after expenses, according to a survey conducted by the American Chiropractic Association.

Related Occupations

Chiropractors diagnose, treat, and work to prevent diseases, disorders, and injuries. They emphasize the importance of the nervous system for good health. Others whose professions require similar skills include acupuncturists, audiologists. dentists, naturopathic doctors, optometrists, osteopaths, podiatrists, speech pathologists, and veterinarians.

Sources of Additional Information

The board of licensing in each State capital can supply information on State license requirements for chiropractors. Information on license requirements and limitations on the scope of practice for all States is contained in *The Directory* available for $10 from:

Federation of Chiropractic Licensing Boards, 501 East California Ave., Glendale, Calif. 91206.

General information on chiropractic as a career is available from:

American Chiropractic Association, 1916 Wilson Blvd., Arlington, Va. 22201.

International Chiropractors Association, 1901 L St. NW., Suite 800, Washington, D.C. 20036.

For a list of chiropractic colleges, as well as general information on chiropractic as a career, contact:

Council on Chiropractic Education, 3209 Ingersoll Ave., Des Moines, Iowa 50312.

For information on requirements for admission to a specific chiropractic college, contact the admissions office.

Dentists

(D.O.T. 072)

Nature of the Work

Dentists examine teeth and tissues of the mouth to diagnose and treat diseases or abnormalities. They take X-rays, place protective plastic shields on childrens' teeth, fill cavities, straighten teeth, repair fractured teeth, and treat gum disease. Dentists extract teeth only when necessary and may provide artificial dentures. They also perform corrective surgery of the gums and supporting bones. In addition, they clean teeth and provide other preventive services.

Although dentists spend most of their time with patients, they may devote some time to laboratory work such as making dentures and inlays. Dentists in large cities generally send their laboratory work to commercial firms, however. Some dentists employ dental hygienists to clean patients' teeth and provide instruction for patient self-care. Dentists may also employ other assistants to perform office work, assist in "chairside" duties, and provide therapeutic services under their supervision. (The work of dental hygienists and dental assistants is described elsewhere in the *Handbook*.)

Technological advances in dentistry affect the materials and techniques that dentists employ in their work. For example, dentists are now using new composite materials to repair fractured or disfigured teeth. As new technologies are proven and adopted, the nature of dentistry changes.

Most dentists are general practitioners who provide many types of dental care; about 20 percent practice in one of the eight specialty areas recognized by the American Dental Association (ADA). The largest group of specialists are orthodontists, who straighten teeth. The next largest group, oral and maxillofacial surgeons, operate on the mouth and jaws. The remainder specialize in pedodontics (dentistry for children); periodontics (treating the gums); prosthodontics (making artificial teeth or dentures); endodontics (root canal therapy); public health dentistry; and oral pathology (diseases of the mouth).

Working Conditions

Most dental offices are open 5 days a week, and some dentists have evening hours. Dentists usually work between 35 and 45 hours a week, although some spend more than 50 hours a week in the office. Dentists often work fewer hours as they grow older, and a considerable number continue in part-time practice well beyond the usual retirement age.

Employment

Dentists held about 156,000 jobs in 1984. Because some dentists hold more than one job, the number of jobs exceeds the number of dentists in practice—nearly 138,000, according to the U.S. Public Health Service.

Nine out of ten dentists are in private practice. Of the remainder, about half do research, teach, or hold positions in dental schools. Some work in hospitals and clinics. About 2,000 dentists work in the Federal service, predominantly in the hospitals and clinics of the Veterans Administration and the U.S. Public Health Service.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require dentists to be licensed. To qualify for a license in most States, a candidate must graduate from a dental school approved by the Commission on Dental Accreditation and pass written and practical examinations. In 1984, candidates in 49 States and the District of Columbia could fulfill part of the State licensing requirements by passing a written examination given

Dentistry requires manual dexterity as well as diagnostic skills.

by the National Board of Dental Examiners. Most State licenses permit dentists to engage in both general and specialized practice. In 16 States and the District of Columbia, however, a dentist must obtain a specialty license before practicing as a "specialist." Requirements include 2 or 3 years of graduate education and, in some cases, completion of a special State examination. Extra education also is necessary in the other 34 States, but the dental profession, not the State licensing authority, regulates the specialist's practice. To practice in a different State, a licensed dentist usually must pass that State's examination. However, about 20 States grant licenses to dentists from other States on the basis of their credentials. Dentists who want to teach or do research usually spend an additional 2 to 4 years in advanced dental training in programs operated by dental schools, hospitals, and other institutions of higher education.

Dental schools require a minimum of 2 to 4 years of college-level predental education. In fact, most dental students are college graduates. Four out of five of the students entering dental schools in 1984 had a bachelor's or master's degree. Predental education must include courses in the sciences and humanities.

All dental schools participate in a nationwide testing program, and, in selecting students, they consider scores earned on these tests along with the applicants' overall grade point average (GPA), science course GPA, and information gathered through recommendations and interviews. Many State-supported dental schools give preference to residents of the State.

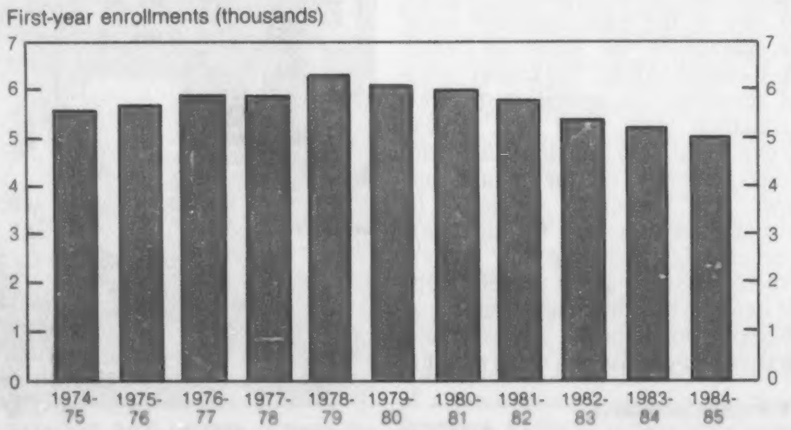
Dental school generally lasts 4 academic years, although one institution condenses the program into 3 calendar years and another program lasts 5 years. Studies begin with classroom instruction and laboratory work in basic sciences including anatomy, microbiology, biochemistry, and physiology. Courses in preclinical technique and beginning courses in clinical sciences also are provided at this time. During the last 2 years, the student treats patients chiefly in dental clinics.

Most dental colleges award the degree of Doctor of Dental Surgery (D.D.S). An equivalent degree, Doctor of Dental Medicine (D.M.D.), is conferred by 20 schools.

Earning a dental degree is a costly process, but financial aid is available from the Federal and State governments, health-related organizations, industry, and dental schools. Many dental students rely on student loans to finance their professional training.

Dentistry requires both manual skills and a high level of diagnostic ability. Dentists should have good visual memory, excellent judgment of space and shape, and a high degree of manual dexterity, as well as scientific ability. Good business sense, self-discipline, and the ability to instill confidence are helpful for success in private practice. High school students who want to become dentists are advised to take courses in biology, chemistry, health, and mathematics.

Although dental school enrollments are declining, the job outlook remains competitive.



SOURCE: American Dental Association, Council on Dental Education

Most dental graduates work for established dentists to gain experience and save money to equip an office of their own. Some dentists purchase established practices or open new practices. Others may enter residency training programs in approved hospitals or dental schools. Dentists who enter the Armed Forces are commissioned as captains in the Army and Air Force and as lieutenants in the Navy. Graduates of recognized dental schools are eligible for positions in the Federal service and for commissions (equivalent to lieutenants in the Navy) in the U.S. Public Health Service.

Job Outlook

Employment of dentists is expected to grow faster than the average for all occupations through the mid-1990's. Among the factors responsible for anticipated job growth are changes in population size and structure, which are expected to boost demand for restorative dentistry. As the baby-boom generation matures, large numbers of middle-aged Americans will be candidates for more intensive dental care. Unlike younger people, who have benefited from advances in dental health, people born before the 1950's tend to have intricate dental work that will require complicated maintenance as they grow older.

Also contributing to job growth for dentists are growing public awareness that regular dental care helps prevent and control dental disease, and fairly widespread dental insurance, which make it easier for people to purchase dental care.

Because of the abundant supply of practitioners, however, the private practice of dentistry is growing increasingly competitive in many areas of the country. The number of dental school graduates rose sharply between 1965 and 1975, as new dental schools were established. The period of expansion came to an end in the late 1970's, and first-year enrollments have fallen from a peak of 6,300 students in 1978-79 to about 5,000 in 1984-85 (see chart). The downturn reflects a number of factors, including the rising cost of dental education, lower returns on the investment in dental education as greater competition for business dampens dentists' earnings, and a smaller applicant pool. Dental school enrollments are expected to continue to decline through the 1980's. Nonetheless, the total number of practicing dentists will continue to grow substantially because many more new graduates will enter the profession each year than will retire or otherwise leave dentistry.

An oversupply of dentists may develop in some localities and intensify in others. If so, various market adjustments are likely in those places—increased evening and weekend office hours (although total hours may be reduced), more competitive fee structures, and less intensive use of dental assistants and dental hygienists, for example. To build clientele, dentists are likely to experiment with new ways of providing care and may, for example, reach out to hitherto underserved groups such as the elderly. Educational advertising campaigns are being used to increase public awareness of the importance of regular dental care. Aimed at that half of our population who are not under the regular care of a dentist, this strategy seeks to broaden the dental care market.

Fluoridation of community water supplies and improved dental hygiene prevent tooth and gum disorders and preserve teeth that might otherwise be extracted. However, since the preserved teeth may need care in the future, these measures may increase rather than decrease the demand for dental care. There will continue to be a need for dentists to teach in dental colleges, administer dental public health programs, and serve in the Armed Forces.

In a departure from the usual pattern, replacement needs create relatively few job opening for dentists. This reflects the fact that dentists have a distinctive employment pattern: once having completed their training and entered dental practice, they tend to work continuously until they reach retirement age. Some older dentists reduce their hours of work because of ill health or desire for leisure, but very few individuals leave dentistry to take up other careers. A comparable degree of occupational attachment is found in only a few other occupations, notably among other health practitioners, who, like dentists, have a considerable investment in training.

Earnings

During the first year or two of practice, dentists often earn little more than the minimum needed to cover expenses, but their earnings usually rise rapidly as their practice develops. Specialists generally earn considerably more than general practitioners. The average income of dentists in general practice was about $60,000 a year in 1984, according to the limited information available. Those in specialty practices averaged about $95,000 a year. In the Federal Government, new graduates of dental schools could expect to start at $26,400 a year in 1985. Experienced dentists working for the Federal Government in 1984 averaged $54,000; some earned as much as $68,000.

Location is one of the major factors affecting the income of dentists who open their own offices. For example, in high-income urban areas, dental services are in great demand. However, a practice can be developed most quickly in small towns, where new dentists can become known easily and where they may face less competition from established practitioners. Although income in small towns may rise rapidly at first, over the long run the level of earnings, like the cost of living, may be lower than it is in larger communities.

Except for emergencies, dental work generally can be postponed. During periods of high unemployment and economic hardship, therefore, dentists tend to experience a reduction in the volume of work and lower earnings.

Related Occupations

Dentists examine, diagnose, and treat various oral diseases and abnormalities. Others whose work involves personal contact and requires a long and rigorous period of scientific training include psychologists, optometrists, physicians, veterinarians, and podiatrists.

Sources of Additional Information

For information on dentistry as a career and a list of accredited dental schools, contact:

American Dental Association, Council on Dental Education, 211 E. Chicago Ave., Chicago, Ill. 60611.

American Association of Dental Schools, 1619 Massachusetts Ave. NW., Washington, D.C. 20036.

The American Dental Association also will furnish a list of State boards of dental examiners. Persons interested in practicing dentistry should obtain the requirements for licensure from the board of dental examiners of the State where they plan to work.

Prospective dental students should contact the office of student financial aid at the schools to which they apply for information on scholarships, grants, and loans, including Federal financial aid.

Optometrists

(D.O.T. 079.101-018)

Nature of the Work

Half the people in the United States wear glasses or contact lenses. Optometrists (doctors of optometry) provide much of the vision care these people need.

Optometrists should not be confused with either ophthalmologists or dispensing opticians. Ophthalmologists are physicians (doctors of medicine or osteopathy) who specialize in medical eye care, eye diseases, and injuries; perform eye surgery; and prescribe drugs or other eye treatment, as well as lenses. Dispensing opticians fit and adjust eyeglasses and contact lenses according to prescriptions written by ophthalmologists or optometrists; they do not examine eyes or prescribe treatment. (See statements on physicians and dispensing opticians elsewhere in the *Handbook.*)

Optometrists examine people's eyes to diagnose vision problems and detect signs of disease and other abnormal conditions. They also test to insure that the patient has proper depth and color perception and the ability to focus and coordinate the eyes. When necessary, they prescribe lenses and other treatment. When optometrists diagnose diseases requiring treatment beyond the optometric scope of practice, they arrange for consultation with the appropriate health care practitioners. Most optometrists supply the prescribed eyeglasses or contact lenses. Optometrists also prescribe vision therapy or other treatment which does not require surgery. In 45 States, optometrists may use drugs for diagnosis; in 7 of these States, they may also use drugs to treat eye diseases.

Although most optometrists are in general practice, some specialize in work with the elderly or with children. Others work with partially sighted persons, who use microscopic or telescopic lenses. Still others concentrate on contact lenses or vision therapy. Optometrists teach, do research, consult, and serve on health advisory committees of various kinds.

Working Conditions

Optometrists work in places—usually their own offices—that are clean, well lighted, and comfortable. The work requires a lot of attention to detail. Because optometrists, like other health practitioners, generally are self-employed, they have considerable flexibility in setting their hours of work, and often continue to practice after the normal retirement age. Many independent practitioners work well over 40 hours a week, including time on Saturday and in the evening.

Employment

Optometrists held about 29,000 jobs in 1984. The number of jobs is greater than the number of practicing optometrists because some optometrists hold two jobs or maintain two offices. For example, an optometrist may have a full-time private practice and also work part time in another practice, clinic, or vision care center. In recent years, some optometrists have chosen commercial practice rather than private practice. Optometrists who work in commercial vision care centers are not always salaried employees, however. Recently, the trend has been for optometrists to buy franchises from large retail optical chains, thereby operating as independent business owners rather than employees of the chain.

Although the majority of optometrists are in solo practice, a growing number are in partnership or group practices. This trend, especially pronounced among younger optometrists, is associated with education-related indebtedness and the high cost of setting up a solo practice. For the same reason, some optometrists work as salaried employees in the offices of established practitioners. Salaried jobs with health maintenance organizations and other types of health care clinics are becoming more attractive as well.

Some optometrists work in health centers and eye clinics or teach in schools of optometry. Others work for the Veterans Administration, public and private health agencies, and insurance companies.

Some optometrists in private practice also act as consultants to industrial safety programs, insurance companies, manufacturers of ophthalmic products, and others.

More than 9 out of 10 optometrists work full time.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require that optometrists be licensed. Applicants for a license must have a Doctor of Optometry degree from an accredited optometric school or college and pass a State board examination. In some States, applicants can substitute the examination of the National Board of Examiners in Optometry, given in the second, third, and fourth years of optometric school, for part or all of the written State examination. Some States allow applicants to be licensed without lengthy examination if they have a license in another State. In 46 States, optometrists must earn continuing education credits in optometry to renew their licenses.

Optometrists use sophisticated instruments to examine patients' eyes.

The Doctor of Optometry degree requires a minimum of 6 or 7 years of higher education consisting of a 4-year professional degree program preceded by at least 2 or 3 years of preoptometric study at an accredited university, college, or junior college. Most optometry students enter with at least a bachelor's degree. In 1985, there were 16 schools and colleges of optometry in the United States accredited by the Council on Optometric Education of the American Optometric Association. Requirements for admission to these schools usually include courses in English, mathematics, physics, chemistry, and biology or zoology. Some schools also require courses in psychology, social studies, literature, philosophy, and foreign languages. All applicants must take the Optometry College Admissions Test (OCAT). Competition is keen for admission to optometry schools. Therefore, superior grades in preoptometric college courses may enhance one's chances for acceptance.

Because most optometrists are self-employed, business ability, self-discipline, and the ability to deal with patients tactfully are necessary for success.

Many beginning optometrists enter into associate practice with an optometrist or other health professional. Others purchase an established practice or set up a new practice. Some take salaried positions to obtain experience and the necessary funds to start their own practice.

Optometrists wishing to advance in a specialized field may study for a master's or Ph.D. degree in visual science, physiological optics, neurophysiology, public health, health administration, health information and communication, or health education. One-year postgraduate clinical residency programs also are available in optometric specialties including family practice optometry, pediatric optometry, geriatric optometry, low vision rehabilitation, vision training, contact lenses, hospital-based optometry, and primary care optometry. Optometrists who enter the Armed Forces as career officers have the opportunity to work toward advanced degrees and to do research on vision problems.

Job Outlook

Employment of optometrists is expected to grow faster than the average for all occupations through the mid-1990's. The growth and changing age structure of the population are major factors underlying anticipated job growth. Visits to both optometrists and ophthalmologists are substantially higher for persons over the age of 45, reflecting the onset of vision problems in middle age. Also likely to spur demand for optometric services are rising per capita income (which permits people to pay for more frequent doctor visits) and greater recognition of the importance of vision care.

Replacement needs are expected to produce additional job openings in the years ahead. In this occupation, replacement needs arise almost entirely from retirements and deaths. Optometrists, like other health practitioners, have a strong attachment to their profession and generally remain in practice until they leave the labor force; few transfer to other occupations. Because a third of all active optometrists are between 50 and 65 years of age, it is likely that a large number of experienced optometrists will leave the profession by the mid-1990's.

Earnings

In 1984, net earnings of new optometry graduates in their first full year of practice averaged about $27,000. Experienced optometrists averaged about $55,000 annually. Optometrists working for the Federal Government earned an average of $31,600 a year in 1984. Incomes vary greatly, depending upon location, specialization, and other factors. Optometrists who start out by working on a salaried basis tend to earn more money initially than optometrists who set up their own solo practice. However, in the long run, those with their own private practice generally earn more than those employed by other optometrists, hospitals, health agencies, retail stores, or other firms.

Related Occupations

Workers in other occupations who apply logical thinking and scientific knowledge to prevent, diagnose, and treat disease, disorders, or injuries in humans or animals are chiropractors, dentists, osteopathic physicians, physicians, podiatrists, and veterinarians.

Sources of Additional Information

For information on optometry as a career, write to:

American Optometric Association, Education and Manpower Division, 243 North Lindbergh Blvd., St. Louis, Mo. 63141.

Additional career information and a listing of accredited optometric educational institutions, as well as required preoptometry courses, can be obtained from:

Association of Schools and Colleges of Optometry, Suite 410, 600 Maryland Ave. SW., Washington, D.C. 20024.

The Board of Optometry in the capital of each State can supply information on licensing requirements.

For information on admission requirements and sources of financial aid, including Federal loans and scholarships, contact individual optometry schools.

Physicians

(D.O.T. 070 and 071)

Nature of the Work

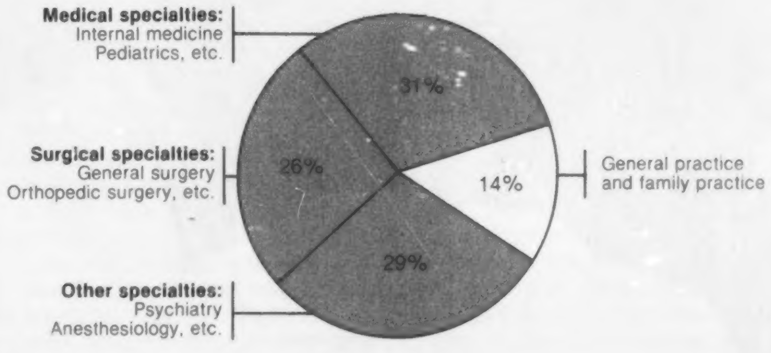
Physicians perform medical examinations, diagnose illnesses, and treat people who are suffering from injury or disease. They also advise patients on maintaining good health. There are two types of physicians: the M.D.—Doctor of Medicine—and the D.O.—Doctor of Osteopathy. Despite differences in training and philosophy of treatment, both M.D.'s and D.O.'s use all accepted methods of treatment, including drugs and surgery. Osteopathic physicians, however, place special emphasis on the musculoskeletal system of the body—bones, muscles, ligaments, and nerves. One of the basic treatments or therapies used by osteopathic physicians centers on manipulating this system with the hands.

Physicians may be general practitioners or they may specialize in a particular field of medicine. Most D.O.'s are general practitioners, providing primary care; about 25 percent are specialists. On the other hand, about 85 percent of the M.D.'s who provide patient care are specialists. (See chart). The largest of the medical specialties for which there is graduate medical training are internal medicine, family medicine, general surgery, obstetrics and gynecology, psychiatry, pediatrics, radiology, anesthesiology, ophthalmology, pathology, and orthopedic surgery. Some of the primary care specialties have shown especially rapid growth—family practice, internal medicine, and pediatrics. Some physicians combine the practice of medicine with research or teaching in medical schools.

Advances in medical technology in recent years have been many and dra-

Specialists outnumber general practitioners.

Percent of physicians by specialty group, 1983



SOURCE: American Medical Association

matic. Liver and kidney transplants, laser surgery, and ultrasound and magnetic resonance imaging are but a few of these new technologies. Some are opening entirely new areas of medical practice; others are replacing traditional treatment methods.

The emphasis on technology has implications for the way physicians are trained and the way they practice medicine. High-technology medicine requires extensive skills and training. Its dominant role in American medical care underlies the system of specialty medicine, whereby most M.D.'s are specialists and few are general practitioners. Further, the cost of technology is largely responsible for making the hospital the site of the most advanced medical care. Only hospitals and very large clinics or group medical practices can afford to purchase the most costly equipment. It is beyond the means of individual physicians or small groups.

Working Conditions

Physicians who practice alone or in small groups generally work long, irregular hours. Most specialists work fewer hours each week than general practitioners. As doctors approach retirement age, they may accept fewer new patients and tend to work shorter hours. However, many continue in practice well beyond 70 years of age.

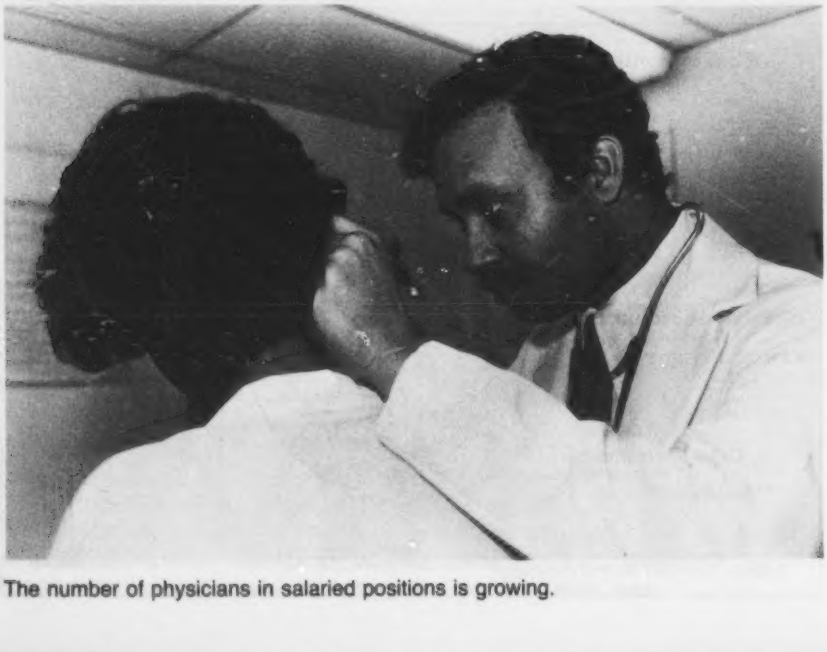
Contractual arrangements in the rapidly evolving outpatient care sector vary enormously. An outpatient surgical center, for example, may be operated by several physicians as a group medical practice. Work patterns of such physicians resemble those of other physicians in group practice. Physicians in many outpatient care settings such as health maintenance organizations (HMO's) and urgent care centers are salaried employees. They generally work a standard 40-hour week, although some are moonlighters and work on a part-time basis.

Employment

Physicians held about 476,000 jobs in 1984. Because young physicians in particular frequently "moonlight," the number of jobs exceeds the number of individuals who are in practice—about 435,000 M.D.'s and 20,000 D.O.'s in 1984, according to the American Medical Association and the American Osteopathic Association.

About half of all physicians are in office-based practice. Few of these are solo practitioners. As medical care shifts from hospitals to outpatient settings, the number and size of group medical practices are growing. Sometimes organized as clinics and sometimes as a group of physicians in the same or different specialties, large groups can realize economies of scale and can afford expensive equipment that is beyond the means of solo practitioners.

About one-fourth of all physicians were residents or full-time staff members in hospitals in 1984. The rest practiced in a variety of settings, including HMO's, clinics, urgent care centers, birthing centers, surgicenters, public health clinics, schools, prisons, and business firms.



The number of physicians in salaried positions is growing.

The Northeast has the highest ratio of physicians to population; the South, the lowest. More than half of all D.O.'s practice in cities and towns of fewer than 50,000 residents. M.D.'s, on the other hand, have tended to locate in urban areas, close to hospital and educational centers, so many rural areas have been underserved. Currently, more medical students are being exposed to practice in rural communities with the direct support of educational centers and hospitals in more populous areas. Some rural areas offer physicians guaranteed minimum incomes to offset the relatively low earnings typical in rural medical practice.

Osteopathic physicians are located chiefly in those States that have osteopathic hospitals. In 1984, three-fifths of all D.O.'s were in Florida, Michigan, Pennsylvania, New Jersey, Ohio, Texas, and Missouri. Seventeen States and the District of Columbia each had fewer than 50 osteopathic physicians in 1984.

Training and Other Qualifications

All States, the District of Columbia, and Puerto Rico require physicians to be licensed. Licensure requirements for both D.O.'s and M.D.'s include graduation from an accredited professional school, successful completion of a licensing examination, and, in most States, 1 or 2 years of supervised practice in an accredited graduate medical education program (internship/residency). The licensing examination taken by most graduates of U.S. medical schools is the National Board of Medical Examiners (NBME) test that all States except Texas and Louisiana accept.

Graduates of foreign medical schools generally begin practice in the United States after completing a U.S. hospital residency training program. To enter an approved residency, graduates of foreign medical schools usually must pass an examination administered by the Educational Commission for Foreign Medical Graduates and be certified by that organization. After 1 year of work in an approved residency, foreign medical graduates, as well as graduates of U.S. medical schools who have not taken the NBME test, must take the Federation

Licensure Examination (FLEX) that all jurisdictions accept. Although physicians licensed in one State usually can get a license to practice in another without further examination, some States limit reciprocity.

Of the 127 accredited schools in the United States in which students can begin study for the M.D. degree, 126 award the degree of Doctor of Medicine (M.D.). One school offers a 2-year program in the basic medical sciences to students who transfer to another medical school for the last semesters of study. Fifteen schools of osteopathic medicine award the degree of Doctor of Osteopathic Medicine (D.O.).

The minimum educational requirement for entry to a medical or osteopathic school is normally 3 years of college; some schools require 4 years. A few medical schools allow exceptional students to begin their professional study after 2 years of college. Most students have at least a bachelor's degree, and many have advanced degrees.

Required premedical study includes undergraduate work in English, physics, biology, and inorganic and organic chemistry. Students also should take courses in the humanities, mathematics, and the social sciences to acquire a broad general education. Studies have shown that medical students with undergraduate majors in the humanities do as well in their medical studies as those who major in the sciences or a "premedical curriculum."

Medicine is a popular field of study, and applicants must compete for entry with highly motivated students who generally have excelled in preprofessional education. Factors considered by the schools in admitting students include their academic record and their scores on the Medical College Admission Test, which almost all applicants take. Consideration also is given to the applicant's character, personality, and leadership qualities, as shown by personal interviews, letters of recommendation, and extracurricular activities. Osteopathic colleges give considerable weight to a favorable recommendation by an osteopathic physican familiar with the applicant's background. Many State-supported schools give preference to State residents and, sometimes, to residents of nearby States.

Students spend the first semesters of medical school primarily in laboratories and classrooms learning basic medical sciences such as anatomy, biochemistry, physiology, pharmacology, microbiology, and pathology. Students in most schools gain some clinical experience with patients during the first 2 years of study, learning to take case histories, perform examinations, and recognize symptoms. During the last semesters, students work under supervision in hospitals and clinics to learn the important aspects of acute, chronic, preventive, and rehabilitative care. Through these required rotations in internal medicine, obstetrics and gynecology, pediatrics, psychiatry, and surgery, they gain experience in the diagnosis and treatment of illness.

After graduation, almost all M.D.'s complete 1 or 2 years of graduate medical education (residency). Nearly all D.O.'s serve a 12-month rotating internship (including experience in surgery, pediatrics, internal medicine, and other specialties.)

Physicians who have completed 1 year of graduate medical education and enter active military duty initially serve as captains in the Army or Air Force or as lieutenants in the Navy. Graduates also qualify for professional medical positions in the Federal civil service.

Physicians seeking certification in a specialty spend from 3 to 5 years—depending on the specialty—in advanced residency training, followed by 2 or more years of practice in the specialty. Training in a medical specialty is lengthy and rigorous but virtually indispensable in view of the enormous amount of information to be absorbed. Moreover, technologically based medical practice requires such a high level of skill that an extensive period of supervised experience is necessary. Passing the appropriate specialty board examination is the final step in becoming a board-certified M.D. or D.O.

Physicians who want to teach or do research may take graduate work leading to a master's or Ph.D. degree in a field such as biochemistry or microbiology.

A physician's training is very costly. However, loans and scholarships are available from the Federal Government, State and local governments, and private sources. To receive this aid, the student may have to demonstrate financial need or agree to serve at least 3 years in the Armed Forces upon graduation.

Persons who wish to become physicians must have a strong desire to serve the sick and injured. They must be self-motivated and competitive to survive the pressures of premedical and medical education and the demanding workload during the internship/residency that follows medical school. They must study a great deal to keep up with the latest advances in medical science. Sincerity and a pleasant personality are helpful in gaining the confidence of patients. Physicians should be emotionally stable and able to make decisions in emergencies.

In view of the variation in State laws, students interested in becoming physicians should study carefully the professional and legal requirements of the State in which they plan to practice.

Job Outlook

Job opportunities for physicians through the mid-1990's will reflect faster than average employment growth plus the need to replace experienced physicians who leave the medical profession.

Population growth and aging contribute to the need for more physicians. Especially rapid growth is projected for the elderly population, which makes much greater use of physicians' services than younger persons. Demand for medical care is governed by ability to pay, and access to physicians' services is widespread as a result of broad health insurance coverage—through private insurance, now a standard employee benefit, as well as through public programs including Medicare and Medicaid. In addition, more physicians will be needed for medical research and for the growing fields of public health, rehabilitation, and industrial medicine.

Replacement needs in medicine and osteopathic medicine account for fewer job openings than in most other occupations, because physicians exhibit very strong attachment to their work. Once having completed training and entered medical practice, physicians tend to remain in the labor force until they retire. Moreover, relatively few leave medicine for other careers.

The supply of physicians may exceed demand in the decade ahead. The prospective oversupply reflects past decisions about expanding the capacity of the Nation's medical schools, and has relatively little to do with sweeping changes in the organization and financing of health care that are currently underway. About 20 years ago, a perceived shortage of doctors ignited an explosion in medical school enrollments that ended in the late 1970's. Enrollment levels have changed little since then, but that expansion left in place an enlarged student "pipeline" that will produce an abundant supply of newly trained practitioners through the mid-1990's.

Foreign-trained physicians (including U.S. citizens who receive their medical training abroad) are an important element in the Nation's supply of physicians, although the Bureau of Health Professions expects fewer foreign-trained physicians to enter practice in the decade ahead than was true in the past.

The Nation's health care system is being altered in important ways. Changes in the way government pays for hospital care under Medicare and Medicaid, together with efforts by insurance companies and major corporations to contain outlays for employee health benefits, have sharply blunted the rising use of hospitals and shifted some of that demand to outpatient facilities.

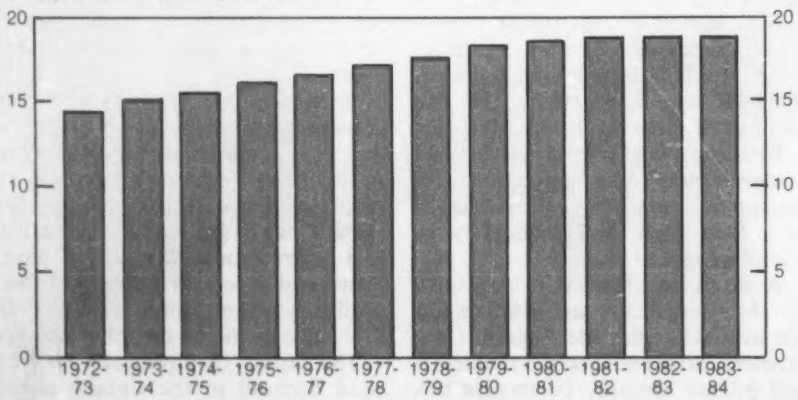
The implications of these changes for physicians will be greatest in the area of practice setting and contractual arrangements (salaried employee or fee-for-service practitioner). The increased popularity of HMO's, freestanding birthing centers, and other outpatient facilities means that more physicians are working in what are still viewed as "nontraditional" practice settings. As these and other emerging organizations play an increasingly dominant role in the medical care market, more and more physicians will work for a salary.

It is possible that prepaid arrangements such as HMO's could dampen demand for physicians. If, as scattered evidence suggests, HMO's can provide care with fewer physicians than fee-for-service practice, accelerated growth of HMO's would mean fewer new jobs for physicians than currently anticipated.

Competition for graduate medical residencies will intensify since the number of first-year residency positions will closely match the number of graduates from U.S. medical schools. Newly trained physicians are likely to experience competition as they seek to launch a practice. Competition will be especially stiff in large cities, and in areas considered attractive due to educational or recreational resources or natural beauty. Physicians in many such areas already report declines in patient load or earnings. Those who are willing to locate in inner cities, rural areas, and other places where doctors are not in oversupply should have little difficulty.

Intensified competition due to substantial growth in the supply of newly qualified M.D.'s and D.O.'s is certain to affect physicians' earnings.

High medical school enrollments have contributed to the increasingly competitive outlook for physicians.



SOURCES: Association of American Medical Colleges; American Association of Colleges of Osteopathic Medicine

Earnings

Stipends of medical school graduates serving as residents in hospitals vary according to the type of residency, geographic area, and size of the hospital, but allowances of $20,000 to $24,000 a year are common. Many hospitals also provide full or partial room and board and other maintenance allowances to residents.

Graduates who had completed approved 3-year residencies but had no other medical experience received a starting salary at Veterans' Administration hospitals of about $44,400 a year in 1985. In addition, those working full time received up to $13,000 in other cash benefits or "special" payments.

Newly qualified physicians who establish their own practice must make a sizable financial investment to equip a modern office. During the first year or two of independent practice, physicians probably earn little more than the minimum needed to pay expenses. As a rule, however, their earnings rise rapidly as their practice develops.

Physicians have among the highest average annual earnings of any occupational group. According to information from the American Medical Association, physicians in pediatrics and family or general practice had average earnings, after expenses, of just over $71,000 in 1984. Surgeons averaged about $152,000 after expenses. The average income of all physicians for 1984 was about $108,400. Earnings of physicians depend on factors such as the region of the country; patients' income; and the physician's skill, personality, professional reputation, and experience. Self-employed physicians usually earn more than those in salaried positions.

Related Occupations

Physicians work to prevent, diagnose, and treat diseases, disorders, and injuries. Professionals in other occupations that require similar kinds of skill and critical judgment include audiologists, chiropractors, dentists, optometrists, podiatrists, speech pathologists, and veterinarians.

Sources of Additional Information

For a list of approved medical schools, as well as general information on premedical education, financial aid, and medicine as a career, contact:

American Medical Association, 535 N. Dearborn St., Chicago Ill. 60610.

Association of American Medical Colleges, One Dupont Circle NW., Suite 200, Washington, D.C. 20036.

For general information on osteopathic medicine as a career, contact:

American Osteopathic Association, Department of Public Relations, 212 East Ohio St., Chicago, Ill. 60611.

American Association of Colleges of Osteopathic Medicine, 6110 Executive Blvd., Rockville, Md. 20852.

Information on Federal scholarships and loans is available from the directors of student financial aid at schools of medicine and osteopathic medicine. Information about Armed Forces Health Professions Scholarships is available from any local military recruiting office.

Persons who wish to practice medicine or osteopathic medicine in a particular State should inquire about licensure requirements directly from the board of examiners of that State.

Podiatrists

(D.O.T. 079.101-022)

Nature of the Work

Because we use them so often in walking, running, or just standing, we are constantly and painfully aware when our feet hurt. A growing number of foot sufferers visit a doctor of podiatric medicine, or podiatrist, for relief. Podiatrists diagnose and treat diseases and disorders of the foot. Much of their practice is devoted to treating soft-tissue complaints such as corns, bunions, calluses, ingrown toenails, and skin and nail diseases. To help in diagnosis, podiatrists take X-rays and order laboratory tests. Depending on the condition, they may fit corrective devices, prescribe drugs, order physical therapy, or recommend proper shoes. Surgery, performed in hospitals, outpatient surgery centers, clinics, or podiatrists' offices, is an increasingly important part of podiatric practice.

Podiatrists are trained to identify systemic diseases such as arthritis, diabetes, and heart disease. If they find symptoms of a systemic disorder, they refer the patient to a medical doctor while continuing to treat the foot problem.

Most podiatrists provide all types of foot care. After completing additional training, however, some specialize in podiatric surgery, orthopedics (bone, muscle, and joint disorders), podopediatrics (children's foot ailments, or podogeriatrics (foot problems of the elderly).

Working Conditions

Podiatrists usually work independently in their own offices. They generally work 40 hours a week, and they set their hours to suit their practice.

Employment

Podiatrists held about 11,000 jobs in 1984. While the majority of podiatrists are in private practice, some are employed by other podiatrists. Hospitals, health maintenance organizations, and podiatric medical colleges employ podiatrists as well. The Veterans Administration and public health departments also employ podiatrists.

Like other health practitioners, podiatrists work mainly in large cities, but geographic imbalances are especially pronounced in podiatric medicine. This reflects the fact that the majority of podiatry students are residents of the six States in which podiatric education is offered, and, after graduation, many of them prefer to set up practice close to home. This pattern has left large areas of the country, particularly in the South and Southwest, with few practitioners even though the total number of podiatrists has grown substantially in recent years.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require a license for the practice of podiatric medicine. To qualify for a license, an applicant must graduate from an accredited college of podiatric medicine and pass a written and oral examination. In some States, applicants can substitute the examination of the National Board of Podiatric Examiners, given in the second and fourth years of podiatry school, for part or all of the written State examination. Many States grant licenses without further examination to podiatrists already licensed by another State.

The six colleges of podiatric medicine are located in California, Illinois, Iowa, New York, Pennsylvania, and Ohio. Minimum entrance requirements include 3 years of undergraduate college work with courses in English, chemistry, biology or zoology, physics, and mathematics. Most entrants surpass the minimum requirements. About 85 percent of the class entering in 1984 held at least a bachelor's degree, and the average enrollee had an overall grade point average of "B" or better. All colleges of podiatric medicine require applicants to earn an acceptable score on the Medical College Admissions Test.

Of the 4 years in podiatry school, the first 2 are spent in classroom instruction and laboratory work in anatomy, bacteriology, chemistry, pathology, physiology, pharmacology, and other basic sciences. During the final 2 years, students gain clinical experience while continuing their academic studies. Graduates are awarded the degree of Doctor of Podiatric Medicine (D.P.M.).

Additional education and experience are necessary to practice in a specialty. Currently, about three-fourths of all graduates complete 1-3 years of graduate education (sometimes called a residency or preceptorship) following the D.P.M. degree. Competition for admission to residency programs is keen. Since licensure requirements in eight States (Arizona, California, Georgia, Michigan, New Jersey, Oklahoma, Rhode Island, and Virginia) call for completion of at least 1 year of post graduate education, failure to secure a residency can limit a new graduate's practice options. First-year residencies provide clinical training and experience in primary care in one or more disciplines such as orthopedics, pathology, radiology, surgery, and emergency care. Second- and third-year residencies provide more extensive training in a specialty, usually in surgery. Board cer-

Podiatrists diagnose and treat foot problems.

tification is offered in two specialties: Podiatric orthopedics and podiatric surgery.

Federal, State, and private loans are available for students to pursue full-time study leading to a degree in podiatric medicine. Private funding and work-study programs are also available.

Persons planning a career in podiatry should have scientific aptitude and manual dexterity, and like detailed work. A good business sense and congeniality also are assets, as in any medical profession.

Most newly licensed podiatrists set up their own practices. Some purchase established practices, or take salaried positions to gain the experience and money they need to begin their own practices.

Job Outlook

Employment of podiatrists is expected to grow much faster than the average for all occupations through the mid-1990's as podiatric medicine continues to gain recognition as a health profession, causing more people to turn to podiatrists for foot care. The growing popularity of jogging, tennis, racquetball, and other fast-moving sports will spur demand in the specialty of podiatric sports medicine. The aging of the population will also increase demand for podiatrists. Many older people have foot problems.

Because health insurance helps people pay for podiatric care, widespread access to health insurance will contribute to increased demand in the years ahead—provided current benefit patterns are not altered substantially. Generally speaking, Medicare and most private health insurance programs cover acute medical and surgical foot services as well as diagnostic X-rays, fracture casts, and leg braces; Medicaid podiatry benefits vary enormously from State to State. Routine foot care—including the removal of corns and calluses—is not ordinarily paid for by health insurance. Health maintenance organizations and other prepaid plans may provide routine foot care, however.

In addition to opportunities created by rapid growth in employment, many openings will result from the need to replace podiatrists who retire or stop working for other reasons. Opportunities for graduates to establish new practices, as well as to enter salaried positions, should be favorable.

Earnings

Newly licensed podiatrists build their practices over a number of years. Income during the first several years is usually low but generally rises significantly as the practice grows. From the limited information available, a net income of about $50,000 a year is common for established podiatrists. Newly licensed podiatrists hired by Veterans Administration hospitals earned starting salaries between $26,381 and $31,619 in 1985.

Related Occupations

Podiatrists work to prevent, diagnose, and treat diseases, disorders, and injuries. Other occupations that require similar skills include audiologists, chiropractors, dentists, optometrists, osteopathic physicians, speech pathologists, and veterinarians.

Sources of Additional Information

Information on colleges of podiatric medicine, entrance requirements, curriculums, and student financial aid is available from:

American Association of Colleges of Podiatric Medicine, 6110 Executive Blvd., Suite 204, Rockville, Md. 20852.

For additional information on podiatric medicine as a career, contact:

American Podiatric Medical Association, 20 Chevy Chase Circle NW., Washington, D.C. 20015.

For information about financial assistance programs administered by the U.S. Department of Health and Human Services, write to:

Division of Student Assistance, Health Resources and Services Administration, 5600 Fishers Lane, Rockville, Md. 20857.

Veterinarians

(D.O.T. 073. except .361-010)

Nature of the Work

Think of a veterinary doctor and you may picture someone caring for the family cat or dog. Three out of four veterinarians engage in private practice—they may treat small animals or pets exclusively, concentrate on large animals (livestock, generally), or have a mixed practice of both large and small animals. Veterinarians diagnose medical conditions, perform surgery on sick and injured animals, and prescribe and administer medicines and drugs.

Some veterinarians engage in research, inspection, or education. It is not generally understood that veterinarians contribute to medical research in the field of human health care. Veterinarians may join physicians and scientists in carrying out research at an academic medical center, for example, and explore such topics as techniques of organ transplantation or the efficacy of a new drug. Some veterinarians are in regulatory medicine or public health: They inspect food, investigate outbreaks of disease, and work in scientific laboratories. These veterinarians help prevent the outbreak and spread of animal diseases, some of which—like rabies—can be transmitted to human beings.

Protection of the population from environmental hazards is a major concern of the small but significant number of veterinarians who specialize in toxicology or animal pathology. Although there have been impressive successes in controlling diseases transmitted through food animals, changing technology and more complex methods of food production present new threats to food safety. Residues from herbicides, pesticides, and antibiotics used in food production pose a particular problem. Scientific advances in livestock production have, paradoxically, created a need for veterinarians capable of dealing with contamination of the food chain by toxic chemicals.

Some veterinarians teach in veterinary colleges, work in zoos or animal laboratories, or engage in a combination of clinical and research activities.

Working Conditions

Veterinarians usually treat pet animals in hospitals and clinics. Those in large animal practice usually work out of well-equipped mobile clinics and drive considerable distances between farms and ranches to care for their animal patients. Veterinarians are sometimes exposed to injury, disease, and infection. Those in private practice often work long hours. Veterinarians in rural areas may work outdoors in all kinds of weather. Because they are self-employed, veterinarians in private practice usually can continue working beyond normal retirement age.

Employment

Veterinarians held about 40,000 jobs in 1984. Most were in private practice.

The Federal Government employed about 2,300 veterinarians in civilian jobs, chiefly in the U.S. Department of Agriculture and the U.S. Public Health Service. Other employers of veterinarians are State and local governments, international health agencies, colleges of veterinary medicine, medical schools, research laboratories, livestock farms, animal food companies, and pharmaceutical companies.

Veterinarians are located in all parts of the country, and the type of practice generally varies according to geographic setting. Veterinarians in rural areas mainly treat farm animals; those in small towns usually engage in general practice; those in cities and suburban areas often limit their practice to pets.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require that veterinarians be licensed. To obtain a license, applicants must have a Doctor of Veterinary Medicine (D.V.M. or V.M.D.) degree from an accredited college of veterinary medicine and pass written and, in most States, oral State board proficiency examinations. Some States issue licenses without further examination to veterinarians already licensed by another State.

For veterinarians seeking positions in research and teaching, an additional master's or Ph.D. degree usually is required or, increasingly, specialty board certification in a field such as pathology, toxicology, or laboratory animal medicine. Veterinarians who seek specialty board certification must complete an approved residency program, pass the board's examination, and meet any other board requirements.

The D.V.M. or V.M.D. degree requires a minimum of 6 years of college consisting of at least 2 years of preveterinary study that emphasizes the physical and biological sciences and a 4-year professional degree program. Several veterinary medical colleges require 3 years of preveterinary work, and most successful applicants have completed 4 years of college. In addition to rigorous academic instruction, professional training includes considerable practical experience in diagnosing and treating animal diseases, performing surgery, and performing laboratory work in anatomy, biochemistry, and other scientific and medical subjects.

In 1985, all 27 colleges of veterinary medicine in the United States were accredited by the Council on Education of the American Veterinary Medical Association (AVMA). Admission to these schools is highly competitive. Each year there are many more qualified applicants than the schools can accept. Serious applicants usually need grades of "B" or better, especially in science courses. Experience in part-time or summer jobs working with animals is advantageous. Colleges usually give preference to residents of the State in which the college is located, because these schools are largely State supported. In the South and West, regional educational plans permit cooperating States without veterinary schools to send students to designated regional schools. In other areas, colleges that accept out-of-State students give priority to applicants from nearby States that do not have veterinary schools.

The Federal Government provides some loans for students in schools of veterinary medicine, subject to the availability of funds; service in an underserved area after graduation may cancel the student's obligation to repay the loan.

Most veterinarians begin as employees or partners in established practices. Those who can afford the substantial investment needed for drugs, instruments, and other startup costs may set up their own practices. An even greater investment is needed to open an animal hospital or purchase an established practice.

Newly trained veterinarians may qualify for civilian jobs with the U.S. Government as meat and poultry inspectors, disease-control workers, epidemiologists, research assistants, or commissioned officers in the U.S. Public Health Service. A license is not required for Federal employment.

Job Outlook

Employment of veterinarians is expected to grow faster than the average for all occupations through the mid-1990's, primarily because of growth in the companion animal (horses, dogs, and other pets) population. Emphasis on scientific methods of raising and breeding livestock and poultry, and growth in public health and disease control programs also will stimulate the demand for veterinarians. In addition, many new veterinarians will be needed each year to replace those who retire or die.

Veterinarians usually treat pets in hospitals or clinics.

The supply of veterinarians is projected to grow even faster than demand, however, which means that new veterinary school graduates may encounter stiff competition as they set out to establish a clinical practice.

Veterinary school enrollments have nearly doubled since the mid-1960's. It seems likely that graduations will stabilize at current levels through 1995, but even so, the number of active veterinarians will grow so substantially that an oversupply is a strong possibility. This would affect new graduates setting up "small animal" or pet practices the most. An oversupply might mean competition among practitioners for business; lower-than-anticipated earnings; or difficulty securing a salaried position.

The outlook is bright for veterinarians with specialty training, which generally involves at least 2 years of formal education beyond the basic veterinary medicine degree. Demand for specialists in toxicology and pathology is expected to remain strong, as is the demand for faculty at colleges of veterinary medicine.

Earnings

Newly graduated veterinarians working in private practices of established veterinarians typically earned $19,000 to $21,000 in 1984. After 2 years, earnings rise significantly. The average net earnings of all veterinarians in private practice were about $46,000 in 1984.

Newly graduated veterinarians employed by the Federal Government started at $24,700 a year in 1985. The average annual salary of veterinarians in the Federal Government was $40,000 in 1985.

Related Occupations

Veterinarians use their professional training to prevent, diagnose, and treat diseases, disorders, and injuries. Others who require similar skills are audiologists, chiropractors, dentists, optometrists, physicians, podiatrists, and speech pathologists.

Sources of Additional Information

A pamphlet entitled *Today's Veterinarian* presents information on veterinary medicine as a career and lists accredited colleges of veterinary medicine. A free copy may be obtained by submitting a request, together with a self-addressed, stamped, business-size envelope, to:

American Veterinary Medical Association, 930 N. Meacham Rd., Schaumburg, Ill. 60196.

Information on opportunities for veterinarians in the U.S. Department of Agriculture is available from:

Animal and Plant Health Inspection Service, Field Service Office, Employment Services, Butler Square West, 5th Floor, 100 N. 6th St., Minneapolis, Minn. 55403.

Food Safety and Quality Service, Personnel Division, Butler Square West, 4th Floor, 100 N. 6th St., Minneapolis, Minn. 55403.

For information on scholarships, grants, and loans, contact the financial aid officer at the veterinary schools to which you wish to apply.

Registered Nurses, Pharmacists, Dietitians, Therapists, and Physician Assistants

The health professionals described in this section of the *Handbook* care for the sick, help the disabled, and advise individuals and communities on ways of maintaining and improving their health. Nursing is by far the largest of these occupations: Registered nurses held nearly 1.4 million jobs in 1984. Most of the other occupations described here are much smaller. Physician assistants and occupational therapists, for example, each held about 25,000 jobs in 1984, while recreational therapists accounted for 17,000 jobs.

Registered nurses work primarily in hospitals, where they provide direct patient care, assist in surgery and diagnostic procedures, train and supervise other members of the staff, provide health education for patients and their families, organize health promotion activities for the community, and handle administrative tasks. A growing number of registered nurses work in long-term care facilities such as nursing homes, rehabilitation centers, and mental hospitals. Some engage in occupational or school nursing, while others work in clinics, health maintenance organizations, or physicians' offices, or do private duty nursing. Community and home health is an increasingly important practice setting for registered nurses. With additional training and experience, registered nurses may assume the responsibilities of *nurse practitioners*, *nurse midwives*, or *nurse anesthetists*. In these expanded roles, nurses perform tasks that otherwise would be performed by a physician.

Three principal kinds of nursing education prepare students for careers as registered nurses: Diploma, associate degree, and bachelor's degree programs. The differences should be understood by the prospective nursing student. However, all nursing education programs share the goals of teaching nurses the scientific basis of nursing practice, familiarizing them with the latest treatment and rehabilitation techniques, and equipping them to understand patients' medical, social, and psychological needs.

The relatively new occupation of *physician assistant* (PA) involves direct patient care by workers who are trained to perform many of the more routine tasks normally carried out by a physician. These include taking medical histories, doing routine examinations, and making hospital rounds. Physician assistants work under the direction of a physician, usually right in the office. Some, however, practice in rural health clinics, prisons, and other places where physicians are not readily available. Training commonly lasts 2 years. Admission to PA training is highly competitive, and most students already have a background in one of the health professions. Legal provisions permitting physician assistants to practice are not uniform throughout the country, in part because the occupation is so new.

Therapists use a variety of techniques to help patients who are injured, physically or mentally disabled, or emotionally disturbed. *Physical therapists* use exercise and other treatments to help patients increase strength, mobility, and coordination. *Occupational therapists* teach skills of everyday living, including vocational skills. Their goal is to help patients adapt to their limitations and learn to be as self-sufficient as possible. *Speech pathologists and audiologists* work with children and adults who have speech, language, or hearing impairments. *Recreational therapists*, also known as *therapeutic recreation workers*, use sports, games, crafts, and hobbies as part of the rehabilitation of mentally ill, mentally retarded, or physically handicapped persons. *Rehabilitation counselors*, whose work is closely related to that of therapists, are discussed in the *Handbook* statement on counselors.

A number of other therapists aid in rehabilitation. *Orientation therapists for the blind* help newly blinded persons learn to move about unassisted; to handle such everyday activities as dressing, grooming, eating, and using the telephone; and to communicate by means of Braille, reading machines, or other devices. *Art*, *dance*, and *music therapists* help patients resolve physical, emotional, or social problems through nonverbal means of communication. *Horticultural therapists* use gardening for therapeutic purposes—as a group activity for persons with mental or emotional problems, for example. A bachelor's degree with a health profession specialization is standard preparation for most therapy occupations. For some jobs, a master's degree is essential.

Dietitians and *pharmacists* also use special skills and expertise to assist sick or disabled persons, although they do not provide direct patient care. Having completed college programs that include bacteriology, chemistry, and other sciences, these workers draw on scientific knowledge to devise therapeutic treatments or give advice on the effects of diet or drugs. Both fields offer opportunities to practice in a variety of settings. Dietitians plan diets to meet the nutritional needs of groups as diverse as hospital patients, school children, prisoners, and hotel guests. Pharmacists generally work in hospitals or community pharmacies where they dispense drugs and medicines prescribed by health practitioners. Like other health professionals, dietitians and pharmacists sometimes teach or do consulting work in addition to their primary job.

Pharmacists, physical therapists, and registered nurses must have a license to practice. Students considering one of these careers should investigate the licensing requirements in the State where they plan to work. Complementing the occupational licensure laws is a voluntary system of gaining credentials, in which professional associations and other nongovernmental bodies attest to an individual's competence through certification or registration.

Employment in these occupations is expected to grow at different rates through the mid-1990's, reflecting the impact of anticipated changes in the health care system. Growing concern about cost has set in motion a number of developments that are likely to transform the entire system by 1995. Of foremost importance is the trend toward greater reliance on outpatient, in-home, and community-based services, and less reliance on inpatient hospital care.

Health insurance terms that prescribe which services are reimbursable will be more important than ever in determining the industry and occupational "mix" of health sector employment. Providing Medicare coverage for hospice services, for example, has helped stimulate demand for nurses, social workers, and pastoral counselors in hospices, although it is important to bear in mind that volunteers provide most hospice care. Similarly, if nursing home and other long term care benefits were covered by private health insurance, demand for nursing and therapy personnel might rise even faster than currently anticipated.

Several other sections of the *Handbook* contain statements on health careers. Check the alphabetical index at the back to locate the statements on health services managers, dental assistants, medical assistants, nursing aides and psychiatric aides, dispensing opticians, and dental laboratory technicians.

Books and brochures on health careers are available in libraries, counseling centers, and bookstores. The Sources of Additional Information section at the end of each *Handbook* statement identifies organizations that can provide pamphlets, lists of accredited schools, and sources of financial aid. For an overview of jobs in the health field, including some jobs not covered in the *Handbook*, request a copy of "200 Ways to Put Your Talent to Work in the Health Field" from:

National Health Council, 70 West Fortieth St.,
New York, N.Y. 10018.

Dietitians and Nutritionists

(D.O.T. 077 except .121-010)

Nature of the Work

Nutrition is the science of food and its effect on the body. It is concerned with the nutrients in food, their use in body chemistry, and—in the final analysis—the relationship between diet and health. Nutritionists counsel individuals and groups; set up and supervise food service systems for institutions such as hospitals, hotels, prisons, and schools; and promote sound eating habits through education and research. The term "nutritionist" applies to a number of different professionals involved with food science and human nutrition. Among these are dietitians, food technologists, and home economists.

Among dietitians, major areas of specialization include administration, education, research, and clinical and community dietetics.

Administrative dietitians apply the principles of nutrition and sound management to large-scale meal planning and preparation, such as that done in company cafeterias, schools, and other institutions. They supervise the planning, preparation, and service of meals; select, train, and direct food service supervisors and workers; budget for and purchase food, equipment, and supplies; enforce sanitary and safety regulations; and prepare records and reports. Increasingly, dietitians utilize computer programs to plan meals that satisfy nutritional requirements and are economical at the same time. Dietitians who are directors of dietetic departments also decide on departmental policy; coordinate dietetic services with the activities of other departments; and are responsible for the dietetic department budget, which in large organizations may amount to millions of dollars annually.

Clinical dietitians, sometimes called therapeutic dietitians, generally work in hospitals, nursing homes, or clinics. They assess patients' nutritional needs, develop and implement nutrition care plans, and evaluate and report the results. Clinical dietitians confer with doctors and other members of the health care team about patients' nutritional care, instruct patients and their families on the requirements and importance of their diets, and suggest ways to maintain these diets at home. Computer programs enable dietitians to provide patients and their physicians with a complete nutritional analysis of food intake.

Technological advances in nutritional support for the critically ill have enhanced the clinical dietitian's role. In the hospital, dietitians oversee the preparation of custom-mixed high-nutrition formulas for patients who are critically or terminally ill. In the home health field, they help develop and oversee sophisticated nutritional therapies for homebound patients who, because of surgery or illness, are unable to eat regular foods.

Community dietitians or *nutritionists* may counsel individuals and groups on sound nutrition practices to prevent disease, maintain health, and rehabilitate persons recovering from illness. They may engage in teaching and research with a community health focus. This work covers areas such as special diets, meal planning and preparation, and food budgeting and purchasing. Dietitians or nutritionists in this field usually are associated with community health programs; they may be responsible for planning, developing, coordinating, and administering a nutrition program or a nutrition component within the community health program. They work mainly for public and private health and social service agencies, including "meals-on-wheels" programs, congregate meals for older Americans, and nutritional programs for women with infants and young children.

Research dietitians seek ways to improve the nutrition of both healthy and sick people. They may study nutrition science and education, food management, food service systems and equipment, or how the body uses food. Other research projects may investigate the nutritional needs of the aging, persons who have chronic diseases, or space travelers. Research dietitians need advanced training in this field and usually are employed in medical centers or educational facilities, or they may work in community health programs.

Working Conditions

Although most work 40 hours a week, dietitians and nutritionists in hospitals may sometimes work on weekends, and those in commercial food services have somewhat irregular hours. Dietitians and nutritionists spend much of their time in clean, well-lighted, and well-ventilated areas, such as research laboratories, classrooms, or offices near food preparation areas. However, they do spend time in kitchens and serving areas that often are hot and steamy. Dietitians and nutritionists in clinical settings may be on their feet a lot; those involved in consulting spend a significant amount of time traveling.

Hospital dietitians supervise the preparation of meals for patients on special diets.

Employment

Dietitians and nutritionists held about 48,000 jobs in 1984. Health care facilities, including hospitals, nursing homes, and clinics, are a major source of jobs in this field, accounting for nearly 3 out of 5 jobs in 1984. Business firms that provide food services for hospital patients on a contract basis employ a small but growing number of dietitians and nutritionists.

Colleges, universities, and school systems provide approximately 1 job in 10, as do child care or residential care facilities. Other jobs are found in a variety of settings, including prison systems, hotel and restaurant chains, and business firms that provide food service for their employees.

Many dietitians work as consultants, either full time or part time. In addition to serving on the staff of a hospital, for example, a dietitian may be a consultant for another health care facility. Nursing homes use consultants to provide much of their dietitic supervision.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in foods and nutrition or institution management is the basic educational requirement for this field. This degree can be earned in about 270 colleges and universities, usually in departments of home economics and food and nutrition sciences. Required college courses include food and nutrition, institution management, chemistry, bacteriology, and physiology. Other important courses are mathematics, statistics, computer science, psychology, sociology, and economics. It is also possible to prepare for this profession by receiving an advanced degree in nutrition, food service management, or related sciences and providing evidence of qualifying work experience.

To qualify for professional credentials as a Registered Dietitian (R.D.), the American Dietetic Association (ADA) recommends completion of a coordinated undergraduate program which includes an internship; completion of a bachelor's degree, plus an approved dietetic internship or 3 years of approved qualified experience; or 6 months of approved qualified experience plus an advanced degree. The internship lasts 6 to 12 months and combines clinical experience under a qualified dietitian with some classroom work. In 1984, 104 internship programs were accredited by the ADA. Coordinated undergraduate programs enable students to complete their clinical experience requirement while obtaining their bachelor's degree. In 1984, 67 such programs were offered by medical schools and by departments of allied health and home economics in colleges and universities. These programs are accredited by the ADA.

Experienced dietitians may advance to assistant or associate director or director of a dietetic department. Advancement to higher level positions in teaching and research requires graduate education; public health nutritionists usually must earn a graduate degree. Graduate study in institutional or business administration is valuable to those interested in administrative dietetics.

Clinical specialization offers another path to career advancement. As a result of scientific advances that have increased our understanding of the role of nutrition in treating disease, clinical specialization is on the rise. Specialty areas for clinical dietitions include cancer, heart disease, and diabetes.

Persons who plan to become dietitians or nutritionists should have organizational and administrative ability as well as scientific aptitude, and should be able to work well with people. Among the courses recommended for high school students interested in careers as dietitians are home economics, business administration, biology, health, mathematics, and chemistry.

Job Outlook

Employment of dietitians is expected to grow faster than the average for all occupations through the mid-1990's to meet the expanding needs for individual and group meals in nursing homes, hospitals, retirement and life care communities, and social service programs of various kinds. Most job openings, however, will result from the need to replace experienced workers who stop working or transfer to other occupations. A number of experienced dietitians and nutritionists are moving into management positions in private industry, for example.

The factors that underlie future growth in demand for health services—population growth and aging, emphasis on health education and promotion of prudent lifestyles, and widespread ability to pay for care through public and private health insurance—will spur demand for dietitians and nutritionists. Demand is also expected to grow in commercial settings, including catering firms, restaurant chains, and medical supply firms. In addition, dietitians and nutritionists will be needed to staff community health programs, to provide nutritional counseling for employer-sponsored wellness and fitness programs, and to conduct research in food and nutrition.

Staffing flexibility can be facilitated by using full-time and part-time staff. For this reason, opportunities for part-time employment should remain favorable.

Earnings

Entry level salaries of hospital dietitians averaged $18,980 a year in 1984, according to a national survey conducted by the University of Texas Medical Branch. Many experienced hospital dietitians earned more than $28,000 a year.

The starting salary in the Federal Government for those with a bachelor's degree was about $14,390 in 1984. The average Federal salary for dietitians was about $27,800 in 1984.

Dietitians usually receive benefits such as paid vacations, sick leave, holidays, health insurance, and retirement benefits.

Related Occupations

Dietitians and nutritionists apply the principles of nutrition in a variety of situations. Other workers with similar duties include food and home economists, executive chefs, and food service managers.

Sources of Additional Information

For information on accredited dietetic internship and coordinated undergraduate programs, scholarships, registration, and a list of colleges providing training for a professional career in dietetics, contact:

The American Dietetic Association, 430 North Michigan Ave., Chicago, Ill. 60611.

The U.S. Office of Personnel Management, Washington, D.C. 20415, has information on hiring requirements for dietitians in Federal hospitals and for public health nutritionists and dietitians in the U.S. Public Health Service.

The Veterans Administration employs dietitians and maintains a list of eligible applicants. Graduates interested in VA positions may obtain application forms by calling, toll free, 800-368-6008. Residents of Virginia should call 800-552-3045. Those interested in a VA career as a dietitian are encouraged to visit the personnel office of any VA medical center.

Occupational Therapists

(D.O.T. 076.121-010)

Nature of the Work

Occupational therapists treat people of all ages who are mentally, physically, developmentally, or emotionally disabled. Therapists provide their patients with specialized activities which aid them in mastering the skills necessary to perform daily tasks at home, at work, at school, and in the community. For those with a disability, being able to perform a daily activity such as getting dressed without assistance is an important step toward a life that is as independent, productive, and satisfying as possible.

Like other health professionals, occupational therapists usually work as a member of a team which may include a physician, nurse, physical therapist, psychologist, rehabilitation counselor, and social worker. Team members evaluate the patient in terms of their individual specialties and consult with each other to arrive at an overall assessment of the patient's capacities, skills, and abilities. Together they develop goals that meet the patient's needs, and decide what treatment methods to use.

Various activities are used as therapy tools. They are designed to prepare patients to return to work, develop or restore basic functions, and aid in adjustment to disabilities. When working with children, occupational therapists often use toys and games to teach a variety of skills. With other patients, occupational therapists use activities of daily living such as meal preparation, bathing, and dressing, which patients practice in clinic areas set up as kitchens and bathrooms. Woodworking, leatherwork, or other therapeutic activities are used to increase motor skills, strength, endurance, concentration, and motivation as preparation for applying these skills to the tasks of daily life.

Occupational therapists often work with patients who have lost basic functional skills such as unaided movement of their limbs. Loss of motor skills and coordination may result from spinal cord injury, for example, or be associated with a chronic disease such as muscular dystrophy. Therapists provide individuals with adaptive equipment such as wheelchairs, splints, and aids for eating and dressing. They may design and make special equipment for disabled patients and recommend changes in the home or work environment to facilitate functioning.

Computer-aided adaptive equipment offers the prospect of independence to some severely disabled persons. Examples are devices that would allow paraplegic and quadriplegic patients to communicate while confined to a wheelchair or bed, and microprocessors designed to help paraplegics walk. As such devices move out of the research and development stage, occupational therapists will be involved in helping patients learn to use them.

Occupational therapists in mental health settings treat individuals who may be mentally ill, mentally retarded, or emotionally disturbed. Among the emotional disorders that occupational therapists encounter are alcoholism, drug abuse, depression, eating disorders, and stress-related disorders. The occupational therapist's goal is to provide the patient with the functional as well as cognitive, social, and organizational skills necessary to develop a healthier lifestyle. Therapists provide individual and group activities to help people learn to cope with the daily stresses of life and to manage their work and leisure more efficiently. These activities may include crafts that require planning and time management skills, budgeting, shopping, meal preparation and homemaking, self-care, and using community resources such as public transportation and service agencies.

Although they are not necessarily

expert in all these activities, occupational therapists must know enough about them to understand their therapeutic values and to set them into motion.

Occupational therapists tend to work with specific disability or age groups. For instance, approximately 3 out of 5 occupational therapists work principally with persons who have physical disabilities; the rest work with patients who have psychological, emotional, or developmental problems. Some work only with children and young adults; others work exclusively with the elderly.

Besides working with patients, occupational therapists may supervise student therapists, occupational therapy assistants, volunteers, and auxiliary nursing workers. The chief occupational therapist in a hospital may teach medical and nursing students the principles of occupational therapy. Many therapists supervise occupational therapy departments, coordinate patient activities, or are consultants to public health departments and mental health agencies. Some teach or conduct research in colleges and universities.

Keeping notes is an important part of an occupational therapist's job. Some of the records for which an occupational therapist may be responsible include an initial evaluation, progress notes, reports to the physician, special internal staff notes, Medicare records, and discharge notes.

Working Conditions

Although occupational therapists generally work a standard 40-hour week, they may occasionally have to work evenings or weekends. Their work environment varies according to the setting and available facilities. In a large rehabilitation center, for example, the therapist may work in a spacious room equipped with machines, handtools, and other devices that often generate noise. In a nursing home, the therapist may work in a kitchen when using food preparation as therapy. In a hospital, therapists may work directly with patients in the ward. Wherever they work and whatever equipment they use, they generally have adequate lighting and ventilation. The job can be physically tiring because therapists are on their feet much of the time.

Employment

Occupational therapists held more than 25,000 jobs in 1984. The largest number of jobs were in hospitals, including a substantial number in rehabilitation and psychiatric hospitals. Employment of occupational therapists in school systems rose sharply in response to requirements established by the Education for All Handicapped Children Act of 1975. Today, large numbers of therapists work in school systems and schools for handicapped children. Other major employers include nursing homes, home health agencies, community mental health centers, adult day care programs, outpatient clinics, and residential care facilities.

A small but rapidly growing number of occupational therapists are in private practice. Some are solo practitioners, while others are in multispecialty group practices or consulting firms. They typically see patients referred to them by physicians or other health professionals.

Private practitioners also provide occupational therapy services on a contract or consultant basis. Largely because of incentives in the health care financing system, much of the occupational therapy furnished in nursing homes, adult day care programs, and home health agencies is provided by contract rather than by staff therapists.

Training, Other Qualifications, and Advancement

Preparation for this field requires a bachelor's degree in occupational therapy. Twenty-nine States and the District of Columbia require a license to practice occupational therapy. Applicants for a license must have a degree or certificate from an accredited educational program and pass the American Occupational Therapy Association's certification examination.

Certification is available by examination through the American Occupational Therapy Association, which awards the title of registered occupational therapist (OTR) to qualified applicants.

In 1984, entry level education was offered in 62 bachelor's degree programs, 11 postbaccalaureate certificate programs for students with a degree other than occupational therapy, and 36 master's degree programs.

Coursework in occupational therapy programs includes physical, biological, and behavioral sciences and the application of occupational therapy theory and skills. These programs also require students to work for 6 to 9 months in hospitals, health agencies, or schools to gain experience in clinical practice.

Occupational therapists help patients regain manual dexterity and coordination.

Entry to educational programs is highly competitive, and applicants are screened carefully. Persons considering this profession should have above-average academic performance and grades of "B" or better in biology, chemistry, and other high school science courses. In addition to biology and chemistry, high school students interested in a career as an occupational therapist are advised to take courses in health, art, and the social sciences. In choosing among applicants, many educational programs weigh heavily any previous job experience in a health care setting. College students who consider transferring from another academic discipline to an occupational therapy program in their sophomore or junior year need superior grades because competition for entrance to programs is more intense after the freshman year.

Persons considering this career must be able to work with people of all ages, temperaments, and personalities. To gain patients' confidence, it is necessary to have a warm, friendly personality that inspires both trust and respect. It is also necessary to have ingenuity and imagination in adapting activities to individual needs. The potential therapist also needs to be skilled, patient, and resourceful in teaching, since patients often have difficult learning problems.

Newly graduated occupational therapists generally begin as staff therapists. Advancement is chiefly to supervisory or administrative positions; some therapists pursue advanced education to teach or conduct research.

Job Outlook

Employment in this occupation is expected to increase much faster than the average for all occupations through the mid-1990's due to anticipated demand in the areas of rehabilitation, mental health, and long-term care.

The number of people who need rehabilitative services will rise through 1995. Advances in medical technology will continue to save young lives that only a few years ago would have been lost—children with birth defects, for example, and accident victims, a disproportionate number of whom are teenagers and young adults. Moreover, as the baby-boom generation begins to move into middle age, a period of increased risk of heart disease and stroke, demand for cardiac rehabilitation programs is expected to rise. Finally, substantial growth is projected for the population 85 years of age and above, an age group that suffers a very high incidence of disabling conditions.

Demand for occupational therapists will be affected in the years ahead by changes in the way health care is delivered and paid for. Perhaps the foremost consequence of current and anticipated changes in the payment system is a redefinition of the role of the hospital. In the future, more health services will be delivered on an outpatient basis. This will affect occupational therapy as well as other health professions.

Occupational therapists in general hospitals will provide their services on a more intensive basis since patients will be hospitalized for shorter periods, and therapists will be less likely than in the past to see a patient through the entire course of treatment. Instead, they will refer patients for further care to occupational therapists in rehabilitation facilities, nursing homes, and home health agencies. Not surprisingly, hospitals are expected to provide relatively few of the new jobs for occupational therapists over the next decade. Hospitals, nonetheless, are likely to remain the largest single employer of occupational therapists, and turnover alone will create numerous openings.

Restructuring of the health industry is likely to create more jobs for occupational therapists in private practice. Private practitioners often work on a contract basis and treat patients in a wide variety of settings, including hospitals, nursing homes, rehabilitation centers, adult day care programs, and at home.

The home is emerging as an increasingly important practice site, not only because of changes in the way treatment is provided in hospitals, but because of the prevalence of functional disabilities among older persons, plus consumer preference for health care in home or community-based settings. The home health field is expected to experience spectacular growth by the mid-1990's, and should provide excellent opportunities for occupational therapists.

Job prospects in occupational therapy are expected to be excellent through the mid-1990's. Enrollments in occupational therapy programs have leveled off in recent years, primarily because programs are operating at capacity. Barring a significant expansion in the number or size of educational programs, the number of graduates is projected to fall short of job openings due to employment growth and replacement needs.

Earnings

Beginning salaries for occupational therapists in hospitals averaged about $18,900 a year in 1984, according to a national survey conducted by the University of Texas Medical Branch. Experienced occupational therapists earned between $21,300 and $25,700; some administrators earned as much as $33,000.

In 1985, the starting salary for therapists employed by the Federal Government, most of whom worked for the Veterans Administration, was $17,824 a year. The average salary paid occupational therapists with the Federal Government was about $24,000 in 1984.

Related Occupations

Occupational therapists use specialized knowledge to help patients return to their normal activities and achieve maximum independence. Other workers performing similar duties include orthotists, prosthetists, physical therapists, speech pathologists and audiologists, rehabilitation counselors, recreational therapists, art therapists, music therapists, and dance therapists.

Sources of Additional Information

For more information on occupational therapy as a career, a list of education programs, and requirements for certification, write to:

American Occupational Therapy Association, 1383 Piccard Dr., Rockville, Md. 20850.

Pharmacists

(D.O.T. 074.161-010 and -014)

Nature of the Work

The complexity and potential side effects of the thousands of drugs on the market have caused health professionals and the public alike to rely increasingly on the special knowledge of the pharmacist. In addition to providing information about drugs and drug treatments, pharmacists dispense drugs and medicines prescribed by physicians, podiatrists, and dentists. Pharmacists must understand the use, composition, and effect of drugs and how they are tested for purity and strength. They may maintain patient medication profiles and advise physicians on the proper selection and use of medicines. Compounding—the actual mixing of ingredients to form powders, tablets, capsules, ointments, and solutions—is now only a small but important part of a pharmacist's practice, since most medicines are produced by manufacturers in the dose and form used by the patient.

Pharmacists practicing in community pharmacies may have other duties. Besides dispensing medicines, some pharmacists buy and sell nonhealth-related merchandise, hire and supervise personnel, and oversee the general operation of the pharmacy. Other pharmacists, however, practice in community pharmacies that dispense only medicines, medical supplies, and health accessories. Increasingly, pharmacists give advice about and provide home health care supplies.

Pharmacists in hospitals and clinics dispense inpatient and outpatient prescription medications and advise the medical staff on the selection and effects of drugs. They may make sterile solutions, buy medical supplies, teach

Hospital pharmacists prepare injections and intravenous solutions.

in health professions schools, and perform administrative duties. They also may be involved in patient education, monitoring of drug regimens, and drug use review. In addition, pharmacists work as consultants to the medical team on drug therapy and patient care in hospitals, nursing homes, and other health care facilities. Their role is crucial to safe, efficient, and proper therapeutic care.

Some pharmacists prepare and dispense radioactive pharmaceuticals. Called *radiopharmacists* or nuclear pharmacists, they apply the principles and practices of pharmacy and radiochemistry to produce radioactive drugs that are used for patient diagnosis and therapy.

Working Conditions

Pharmacists usually work in a clean, well-lighted, and well-ventilated area that resembles a small laboratory. Shelves are lined with hundreds of different drug products. In addition, some items are refrigerated and many controlled substances (narcotics, depressants, and stimulants) are kept under lock and key. Pharmacists spend a lot of time on their feet. When working with potentially dangerous substances—such as certain anticancer drugs suspected of having long-term side effects—pharmacists must take the proper safety precautions, such as wearing gloves and masks. Because pharmacies in many communities and hospitals are open around the clock, pharmacists in those settings may have to work evenings, nights, weekends, and holidays.

Employment

Pharmacists held about 151,000 jobs in 1984.

About a fifth of all pharmacists own their own businesses; the others hold salaried positions. As the accompanying chart shows, most pharmacists practice in community pharmacies—independently owned or part of a chain. The rest practice in hospitals, pharmaceutical manufacturing companies, wholesaling companies, and government and educational institutions, for the most part. A growing number are employed in ambulatory care settings such as health maintenance organizations (HMO's), ambulatory surgery centers, and outpatient care centers. Pharmacy services in nursing homes generally are provided on a consultant or contract basis rather than by staff pharmacists.

Pharmacists employed by the Federal Government work chiefly in hospitals and clinics of the Veterans Administration and the U.S. Public Health Service. Other Federal agencies that employ pharmacists—for their drug knowledge, as well as to dispense drugs—include the Department of Defense, the Food and Drug Administration and other branches of the Department of Health and Human Services, and the Drug Enforcement Administration. State and local health agencies and pharmaceutical and other professional associations also employ pharmacists.

Some pharmacists hold more than one job. They may work a standard week in their primary work setting and work several hours a week in a secondary setting, as a consultant to a nursing home or clinic, for example. Pharmacy also offers opportunities for part-time employment; about 1 pharmacist in 8 works part time. Most towns have at least one pharmacy with one pharmacist or more in attendance. Most pharmacists, however, practice in or near cities and in those States that have the largest populations. All States require a licensed pharmacist to be in attendance during pharmacy hours. Self-employed pharmacists usually work more hours per week than those in salaried positions because of the additional responsibility of managing a business.

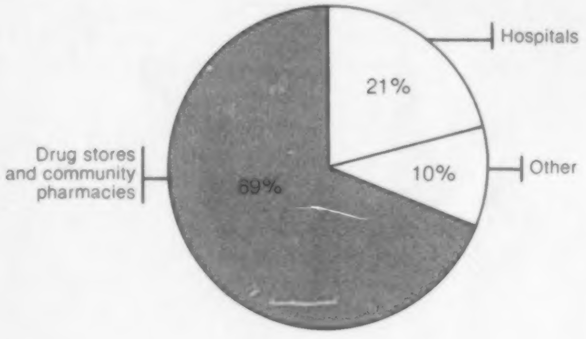
Training, Other Qualifications, and Advancement

A license to practice pharmacy is required in all States, the District of Columbia, and U.S. territories. To obtain a license, one must graduate from an accredited pharmacy program (a few States allow graduation from certain foreign pharmacy programs), pass a State board examination, be over 21, demonstrate good character, and—in all States—have a specified amount of practical experience or serve an internship under the supervision of a licensed pharmacist. Internships generally are served in a community or hospital pharmacy. In 1984, all States except California, Florida, and Hawaii granted a license without reexamination to qualified pharmacists already licensed by another State. Many pharmacists are licensed to practice in more than one State. Many States require continuing education for license renewal.

At least 5 years of study beyond high school are required to graduate from programs accredited by the American Council on Pharmaceutical Education in the 72 colleges of pharmacy. Five years are needed to obtain a Bachelor of Science (B.S.) or a Bachelor of Pharmacy (B.Pharm.) degree, the degrees received by most graduates. A Doctor of Pharmacy (Pharm.D.) degree normally requires 6 years during which an intervening baccalaureate degree is not awarded. Students who already hold the bacca-

Most pharmacists work in drug stores or community pharmacies.

Percent employed by work setting, 1983



SOURCE: National Association of Boards of Pharmacy

laureate degree may be admitted to Pharm.D. programs, but the combined period of study is usually longer than 6 years. Most pharmacy schools offer the baccalaureate degree, and over one-third also offer the professional doctorate degree; seven schools offer only the latter. The Pharm.D. degree as well as the B.S. and B.Pharm. degrees may serve as the entry degree for licensure as a pharmacist.

Admission requirements vary. A few colleges admit students directly from high school. Most colleges of pharmacy, however, require entrants to have completed 1 or 2 years of prepharmacy education in an accredited junior college, college, or university. A prepharmacy curriculum usually emphasizes mathematics and basic sciences, such as chemistry, biology, and physics, but also includes courses in the humanities, social sciences, and business administration. Because entry requirements vary among colleges of pharmacy, prepharmacy students should acquaint themselves with the requirements of the school they wish to attend.

The bachelor's degree in pharmacy is the minimum educational qualification for most positions in the profession. An increasing number of students are enrolled in advanced professional programs leading to the Pharm.D. degree. The Pharm.D. degree is increasingly required for clinical pharmacy work. A master's or Ph.D. degree in pharmacy or a related field usually is required for research work, and a Pharm.D., master's, or Ph.D. usually is necessary for administrative work or college teaching. At least 55 colleges of pharmacy offer the Master of Science degree and at least 48 offer the Ph.D. degree. Although a number of pharmacy graduates interested in further training pursue an advanced degree in pharmacy, there are other options. Some enter 1- or 2-year residency programs in hospital or clinical pharmacy. Others go to medical, dental, or law school, or pursue graduate degrees in related disciplines.

Areas of special study include pharmaceutics and pharmaceutical chemistry (physical and chemical properties of drugs and dosage forms), pharmacology (effects of drugs on the body), pharmacognosy (drugs derived from plant or animal sources), hospital pharmacy, clinical pharmacy, and pharmacy administration. Clinical pharmacy is the application of basic and pharmaceutical science education and the use of this knowledge to solve drug management problems in the care of institutionalized patients. Courses in pharmacy administration are particularly helpful to pharmacists who become executives or managers.

All colleges of pharmacy offer courses in pharmacy practice, designed to teach students the skills involved in compounding and dispensing prescriptions, and to strengthen their understanding of professional ethics and responsibilities. In many cases, professional training increasingly emphasizes direct patient care as well as consultative services to other health professionals.

Colleges of pharmacy are offering a growing number of courses that instruct students in the use of computers in the pharmacy. Increasingly, pharmacists use computers to file and record prescriptions. Some use them for patient medication profiles, so that they can alert patients and their physicians of potential problems, such as drug interactions. Computers are also used for inventory control, billing, and other administrative and clerical tasks.

Pharmaceutical manufacturers, chain drug stores, State and national pharmacy associations, colleges of pharmacy, and other organizations award scholarships annually to students studying full time toward a degree in pharmacy.

Prospective pharmacists should have business sense and the ability to gain the confidence of clients and patients. Honesty, integrity, orderliness, and accuracy are important attributes.

Pharmacists often begin as employees in community pharmacies. After they gain experience and secure the necessary capital, they may become owners or part owners of pharmacies. A pharmacist with experience in a chain drug store may advance to a managerial position, and later to a higher executive position within the company. Hospital pharmacists who have the necessary training and experience may advance to director of pharmacy service or to other administrative positions. Pharmacists in industry often have opportunities for advancement in management, sales, research, quality control, advertising, production, packaging, and other areas.

Some individuals put their pharmaceutical training to work in related fields. For example, pharmacists are hired as sales or medical service representatives by pharmaceutical manufacturers and wholesalers. They provide medicines to community pharmacies and to hospitals and inform health personnel about new drugs. Other pharmacists teach in colleges of pharmacy, supervise the manufacture of pharmaceuticals, or are involved in research and the development of new medicines. Pharmacists also edit or write technical articles for pharmaceutical journals. Some combine pharmaceutical and legal training in jobs as patent lawyers or consultants on pharmaceutical and drug laws.

Job Outlook

Employment of pharmacists is expected to grow more slowly than the average for all occupations through the mid-1990's. This reflects the fact that most jobs for pharmacists are found in drug stores or hospitals, industry sectors that are expected to experience slower growth than in the past. Nevertheless, the growth and aging of the population will create some new jobs. The projected increase in the elderly population is especially important, for the number of prescriptions influences demand for pharmacists, and the elderly are relatively heavy users of medicine.

Other factors likely to increase demand for pharmacists through the mid-1990's include the likelihood of scientific advances that will make more drug products available for the prevention, diagnosis, and treatment of diseases; new developments in administering medication, such as skin patches and implantable pumps; well-informed consumers, increasingly sophisticated about health care and avid for detailed information about drugs and their consequences; and the widespread availability of health insurance, which generally pays for prescription drugs.

Health maintenance organizations and other facilities in the rapidly expanding outpatient care sector should offer good employment opportunities for pharmacists, but it is important to bear in mind that such facilities account for a very small share of jobs in this field.

As in most other occupations, the majority of job openings will result from the need to replace pharmacists who leave the profession. In pharmacy, this generally means retirement, for pharmacists, like physicians and dentists, tend to remain in the field until they retire. Relatively few transfer to other lines of work.

The job outlook for pharmacists is expected to be good; a rough balance between supply and demand is anticipated through the mid-1990's. Moreover, if enrollments in pharmacy colleges decline while demand for pharmacists continues to grow, shortages may develop in some communities or employment settings. Some hospitals, for example, report difficulty attracting and retaining pharmacists.

Earnings

Salaries of pharmacists are generally influenced by the location, size, and type of employer, as well as the duties and responsibilities of the position. Median annual earnings of full-time, salaried pharmacists were about $29,600 in 1984; the middle 50 percent earned between $24,200 and $36,200. Ten percent earned less than $16,600 and 10 percent more than $41,900.

Pharmacists working in chain drug stores had an average base salary of $32,200 per year, while pharmacists working in independent drug stores averaged $28,200, according to a survey by *Drug Topics* magazine. In general, the highest salaries were paid on the West Coast.

The average starting salary for pharmacists working in hospitals, medical schools, and medical centers was about $24,700 a year in 1984, according to a national survey by the University of Texas Medical Branch; experienced pharmacists in these workplaces averaged about $31,600 a year. Pharmacists who do consulting work in addition to their primary job may have total earnings considerably higher than this. Experienced pharmacists, particularly owners or managers of pharmacies, often earn considerably more.

The minimum entrance salary in the Federal Government for a new graduate with a bachelor's degree from an approved pharmacy degree program was about $17,800 a year in 1985. However, most graduates qualified for a beginning salary of about $21,800 a year; those with 2 years of graduate work, about $26,400 a year. Pharmacists with additional years of experience may start at a higher salary. The average salary for all federally employed pharmacists was about $29,200 in 1984.

According to a survey conducted by the American Association of Colleges of Pharmacy, average annual salaries of full-time personnel in colleges of pharmacy during 1984 were as follows: Deans, about $62,800; assistant and associate deans, about $47,100; full professors, around $49,400; associate professors, around $38,300; assistant professors, about $31,100; and instructors, around $26,500.

With the proliferation of chain drug stores, the increasing difficulty of owning a pharmacy, and reductions in hospital budgets, some pharmacists have joined unions. The main unions organizing pharmacists are the United Food and Commercial Workers International Union, Local 1199—Drug, Hospital, and Health Care Workers, an affiliate of the Retail, Wholesale and Department Store Union, and the National Union of Hospital and Health Care Employees.

Related Occupations

Pharmacists dispense the prescription orders of physicians, dentists, and other health practitioners and are responsible for selecting, compounding, dispensing, and preserving drugs and medicines. Workers in other professions requiring similar educational training and who work with pharmaceutical compounds or perform related duties include pharmaceutical scientists, pharmaceutical chemists, and pharmacologists.

Sources of Additional Information

Additional information on pharmacy as a career, preprofessional and professional requirements, programs offered by all the colleges of pharmacy, and student financial aid is available from:

American Association of Colleges of Pharmacy,
4720 Montgomery Lane, Suite 602, Bethesda,
Md. 20814.

General information on pharmacy is available from:

American Pharmaceutical Association, 2215
Constitution Ave. NW., Washington, D.C.
20037.

General information on independent retail pharmacies is available from:

National Association of Retail Druggists, 205
Daingerfield Road, Alexandria, Va. 22314.

General information on the chain drug store industry is available from:

National Association of Chain Drug Stores,
Inc., 413 N. Lee St., P.O. Box 1417-D49,
Alexandria, Va. 22313.

Information concerning hospital pharmacy can be obtained from:

American Society of Hospital Pharmacists,
4630 Montgomery Avenue, Bethesda, Md.
20814.

For a list of accredited colleges of pharmacy, contact:

American Council on Pharmaceutical Education,
311 West Superior St., Chicago, Ill. 60610.

Information on requirements for licensure in a particular State is available from the Board of Pharmacy of the State or from:

National Association of Boards of Pharmacy, O'Hare Corporate Center, 1300 Higgins Rd., Suite 103, Park Ridge, Ill. 60068.

Information on specific college entrance requirements, curriculums, and financial aid is available from the dean of any college of pharmacy.

Physical Therapists

(D.O.T. 076.121-014)

Nature of the Work

Physical therapists plan, organize, and administer treatment in order to restore functional mobility, relieve pain, and prevent or limit permanent disability for those suffering from a disabling injury or disease. Their patients include accident victims, handicapped children, and stroke victims. Physical therapy also is used in the treatment of multiple sclerosis, cerebral palsy, nerve injuries, amputations, fractures, arthritis, heart disease, and other conditions.

Therapists may treat patients with a wide variety of problems, or they may specialize in pediatrics, geriatrics, orthopedics, sports medicine, neurology, or cardiopulmonary diseases.

Initially, physical therapists review and evaluate the patient's condition and medical records, perform tests or measurements, and interpret the findings. Then they develop a treatment plan in cooperation with the patient's physician. The goal is to help patients attain maximum functional independence, muscle strength, and physical skills and, at the same time, adapt to what may be a drastic change in physical abilities. Patients often are suffering emotional as well as physical stress, and treatment requires sensitivity in addition to technical proficiency on the part of the therapist.

Since treatments may be prolonged, the full cooperation of the patient is very important. As a first step, therefore, physical therapists familiarize themselves with patients' personal backgrounds, as well as with their medical histories, and make an effort to gain their trust and confidence. The therapist-patient relationship can be highly important in determining the effectiveness of the treatment.

Therapeutic procedures include exercise for increasing strength, endurance, coordination, and range of motion; electrical stimulation to activate paralyzed muscles; instruction in carrying out everyday activities and in the use of assistive devices; and the application of massage, heat, cold, light, water, electricity, or ultrasound to relieve pain or improve the condition of muscles and skin. To carry out these procedures, therapists must have detailed knowledge of human anatomy and physiology and know what steps may be taken to treat the effects of disease and injury.

Gaining a patient's confidence is an important part of a physical therapist's job.

Treatment can be more effective and progress faster if patients and their families understand the purpose and plan and know just how they can help. Physical therapy services include instructing patients and their families in how to carry on prescribed treatment programs at home. They may need specific instruction in the techniques of muscle contraction and relaxation or in the care and use of braces or prosthetic appliances.

As they treat their patients, physical therapists continually monitor and assess them, in order to identify problems and evaluate progress. This helps them decide whether to modify the treatment plan, to end treatment, or to continue as before. Physical therapists may provide the treatment personally or supervise the work of another therapist or a physical therapist assistant.

Physical therapists keep a variety of notes and records, including initial evaluations, daily progress notes, physician reports, internal staff notes, interdisciplinary conference notes, and discharge notes. Documentation must be maintained to track the patient's progress and to identify areas requiring more or less attention in subsequent treatment visits. Records are also kept for legal purposes; physical therapists are legally responsible for their actions whenever they evaluate a patient, plan a physical therapy program, and carry it out. Finally, accurate records are needed for reimbursement purposes to justify the cost of each treatment billed.

Working Conditions

The working environment of physical therapists varies from specially equipped physical therapy departments of hospitals or clinics to private homes where furniture may need to be moved to provide room for treatment. Thus, a physical therapist must be adaptable.

Evening and weekend hours may be required, especially for those in private practice, who must be available at times convenient for their patients. The job can be physically demanding. In addition to standing for long periods, therapists must move equipment and help patients turn, stand, or walk.

Employment

Physical therapists held about 58,000 jobs in 1984. Some jobs are part time.

Hospitals are the largest single employer of physical therapists, providing 2 out of 5 jobs in 1984. Many other jobs in this field are in rehabilitation facilities, home health agencies, and nursing homes. These may be either staff or contract positions. Therapists also work in residential facilities for handicapped children, school systems, clinics, health maintenance organizations, and physicians' offices.

A substantial number of physical therapists are in private practice. (See chart.) Whether in solo practice, group practice, or associated with a rehabilitation consulting firm, private practitioners normally treat clients referred to them by physicians. (In some States, physical therapists treat clients who come directly to them without a physician referral.) Private practitioners also provide physical therapy services on a contract or consultant basis. Their clients are institutions or organizations such as nursing homes, home health agencies, adult day care programs, and hospitals.

Some therapists teach, conduct research, or serve as consultants.

Training, Other Qualifications, and Advancement

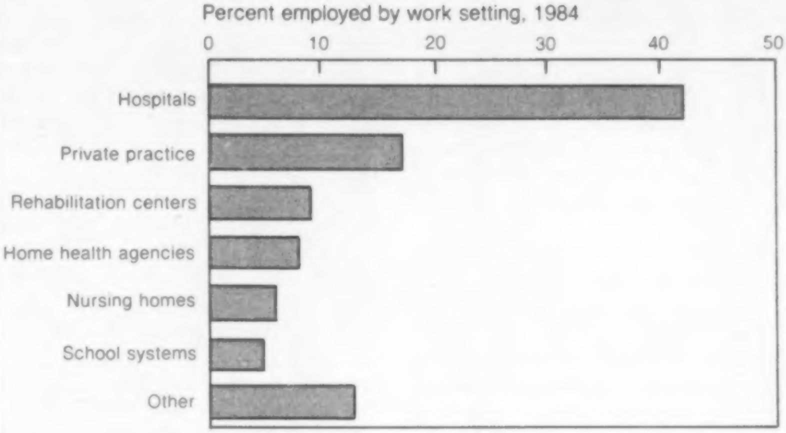
All States, the District of Columbia, and the Commonwealth of Puerto Rico require a license to practice physical therapy. Applicants must have a degree or certificate from an accredited physical therapy educational program prior to taking the licensure examination.

Three different types of programs provide educational preparation for entry level jobs in this field: Bachelor's degree programs in physical therapy; certificate (or second bachelor's degree) programs for those who already hold a bachelor's in another field, such as biology; and entry level master's degree programs in physical therapy.

In 1985, entry level training was offered in 89 bachelor's degree programs, 5 certificate programs, and 13 master's degree programs. One of the master's degree programs is sponsored jointly by the U.S. Army and Baylor University; graduates are commissioned as officers in the Army.

Efforts are underway to raise entry level educational requirements from the bachelor's to the master's degree level. More than half of the programs currently offering bachelor's degrees expect to have a master's degree program in place by 1990.

The majority of physical therapists work in nonhospital settings.



SOURCE: American Physical Therapy Association

The physical therapy curriculum includes science courses such as anatomy, physiology, neuroanatomy, and neurophysiology; it also includes specialized courses such as biomechanics, human growth and development, manifestations of disease and trauma, and courses in specific therapeutic procedures. Besides receiving classroom instruction, students get supervised clinical experience administering physical therapy to patients in hospitals and other treatment centers.

Competition for entry to physical therapy programs is keen. Consequently, students interested in enrolling in a physical therapy program must attain superior grades in their earlier studies, especially in science courses. High school courses that are useful include health, biology, chemistry, social science, mathematics, and physics.

Personal traits that physical therapists need include patience, tact, resourcefulness, and emotional stability to help patients and their families understand the treatments and adjust to their handicaps. Physical therapists also should have manual dexterity and physical stamina. Many persons who want to determine whether they have the personal qualities needed for this occupation volunteer for summer or part-time work in the physical therapy department of a hospital or clinic. Indeed, such experience is required for admission to most education programs.

A graduate degree combined with clinical experience increases opportunities for advancement, especially to teaching, research, and administrative positions.

Job Outlook

Employment of physical therapists is expected to grow much faster than the average for all occupations through the mid-1990's because of anticipated growth in the areas of rehabilitation and long-term care. Many additional openings will result from replacement needs.

Most new positions for physical therapists will result from the expansion of services for people with physical disabilities—a highly diverse group. It includes the elderly, whose number will rise sharply by 1995. Especially rapid growth is projected for the population age 85 and above, a group that suffers a high incidence of disabling conditions such as arthritis or stroke. Also, some surgical procedures are more common among elderly patients. Anticipated growth in hip replacements, knee replacements, and other surgical procedures used to treat diseased or arthritic joints, as well as other conditions, will heighten demand for postoperative physical therapy.

Only part of the growth in the number of persons requiring rehabilitation services will stem from the elderly population. As the baby-boom generation moves into middle age, a period of increased risk of heart disease and stroke, demand for cardiac rehabilitation programs is expected to rise. Young persons, too, may need physical therapy. Advances in medical technology have saved lives that only a few years ago would have been lost: Children with severe birth defects, for example, and car crash victims, a disproportionate number of whom are teenagers and young adults. Future biomedical developments are certain to permit even more people to survive traumas that in the past would have been fatal, thereby creating a need for rehabilitative care.

Other factors likely to spur demand for physical therapy services include the growing importance of sports medicine and widespread interest in health promotion. As more people engage in regular exercise programs, the number of injuries that require physical therapy treatment will grow as well. Among the health promotion and disease prevention programs that are gaining in popularity are those designed to prevent or treat osteoporosis (a degenerative bone disease) and low back pain. These call upon the expertise of the physical therapist.

Demand for physical therapists will be affected in the years ahead by changes in the way health care is delivered and paid for. Perhaps the foremost consequence of the new payment system is a redefinition of the role of the hospital. In the future, more and more health services will be delivered on an outpatient basis. Physical therapists in general hospitals will be expected to provide their services on a more intensive basis since patients will be hospitalized for shorter periods, and they will be less likely than in the past to see a patient through the entire course of treatment. Instead, they will refer patients for further care by physical therapists in rehabilitation facilities, nursing homes, and home health agencies. Not surprisingly, hospitals are expected to provide fewer new jobs for physical therapists than they did in the past. Hospitals, nonetheless, will remain a major employer of physical therapists, and turnover alone will create many openings.

Restructuring of the health industry is likely to create additional opportunities for physical therapists in private practice; favorable third-party reimbursement policies will contribute to the very rapid growth anticipated in this area.

Home health is an increasingly important area of practice, not only because of changes in the way treatment is provided in hospitals, but because of the prevalence of functional disabilities among older persons, plus consumer preference for health care in home or community-based settings. The home health field is expected to experience spectacular growth by the mid-1990's, and should provide excellent opportunities for physical therapists.

Job prospects in physical therapy should continue to be excellent through the mid-1990's. New graduates are in great demand, and the number of people completing training programs is expected to fall short of that needed to fill job openings. Total enrollments in accredited physical therapy programs have remained relatively stable since the mid-1970's. If program completions remain at current levels while demand for rehabilitation services continues to grow, prospects for jobseekers may become even more favorable than they are today.

Earnings

Starting salaries in hospitals for new physical therapy graduates averaged about $19,600 a year in 1984, according to a national survey conducted by the University of Texas Medical Branch.

Beginning therapists employed by the Federal Government earned starting salaries of $17,824 a year in 1985. The average salary paid therapists was about $24,600 annually; supervisory therapists may earn more than $35,000.

Related Occupations

Physical therapists are concerned with the treatment and rehabilitation of persons with physical or mental disabilities or disorders. They may use exercise, massage, heat, water, electricity, and various therapeutic devices to help their patients gain independence. Others who do similar work include occupational therapists, speech pathologists and audiologists, orthotists, prosthetists, respiratory therapists, chiropractors, and athletic trainers.

Sources of Additional Information

Additional information on a career as a physical therapist and a list of accredited educational programs in physical therapy are available from:

American Physical Therapy Association, 1111 North Fairfax St., Alexandria, Va. 22314.

Physician Assistants

(D.O.T. 079.364-018)

Nature of the Work

The occupation of physician assistant (PA) came into being during the 1960's, when physicians were in short supply. Additional education enabled medical corpsmen trained during the Vietnam conflict, as well as some nurses and others with patient-care experience, to relieve physicians of many essential but time-consuming tasks. PA's interview patients, take medical histories, perform physical examinations, order laboratory tests, make tentative diagnoses, and prescribe appropriate treatments. Studies show they have the ability to care for 8 out of 10 people who visit a family practitioner's office in any one day. PA's, however, always work under the direction of a licensed "supervising physician." Alternative titles sometimes used by these workers are MEDEX and physician associate.

About half of all PA's assist physicians in such specialty areas as pediatrics and surgery. They perform routine procedures such as physical examinations, provide postoperative care, and assist during complicated medical procedures such as cardiac catheterizations. These specialist PA's include *child health associates*, *orthopedic physician assistants*, *urologic physician assistants*, *surgeon assistants*, and *emergency room physician assistants*.

Working Conditions

Physician assistants work in the same places as physicians. Hospitals, clinics, and physicians' offices usually provide a comfortable, well-lighted environment, although PA's must often stand for long periods and do considerable walking.

The workweek and schedule vary according to the setting. Some emergency room PA's work 24-hour shifts twice weekly, and others work three 12-hour shifts each week. The workweek of PA's who work in physicians' offices may include some night office hours or early morning hospital rounds to visit patients. PA's in clinics usually work a 5-day, 40-hour week.

Employment

Physician assistants held about 25,000 jobs in 1984. They most commonly work for physicians in private practice. However, hospitals employ an increasing proportion of PA's—now about 20 percent. A small but growing number work for health maintenance organizations (HMO's), other prepaid health plans, or clinics.

Despite efforts to encourage physicians to practice where they are needed most, many rural areas and inner cities remain underserved. Almost 20 percent of all Americans live in counties with a population of less than 50,000, yet less than 10 percent of all active physicians practice in these areas. The PA's who practice there—amounting to 40 percent of all PA's—provide badly needed health care.

Although most PA's in medically underserved areas are associated with physicians in private practice, some work in clinics, where a physician may be available just 1 or 2 days each week. For the rest of the week, a PA working with one or more nurses, technicians, or medical assistants provides all health care services. PA's in these clinics usually have quick telephone access to a physician for consultation. The Rural Health Clinics Service Act of 1977 helped promote this type of practice by making reimbursement by Medicare easier.

Training, Other Qualifications, and Advancement

In the early years of the occupation, informal training was not uncommon, but today, nearly all States require that new PA's complete an approved program. Approximately 16,500 PA's had completed such training programs by 1984. Fifty-two educational programs for primary care physician assistants and three programs for surgeon assistants were approved by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association.

Admission requirements vary, but 2 years of coursework at the college level in science or one of the health professions is usually the minimum requirement. About half of all applicants hold a bachelor's or master's degree but fully one-third hold no formal degree beyond high school.

A background that includes "hands on" health care experience is an important qualification for entry to these highly competitive programs. Most programs require applicants to have experience working directly with patients. Jobs that provide the requisite clinical experience range from medical technologist to registered nurse. The type of job is not particularly important; what counts is a background in direct patient contact.

Long-term job prospects for physician assistants are difficult to assess.

Educational programs are generally 2 years in length, although some are longer and a few are shorter. Most PA programs are located in medical schools, schools of allied health, or 4-year colleges; a few are located in community colleges or are hospital based. Regardless of the institutional sponsorship, most accredited PA programs have clinical teaching affiliations with medical schools or medical school faculty.

PA education begins with a classroom or didactic phase that lasts 6 to 24 months. Classroom instruction includes human anatomy, physiology, microbiology, clinical pharmacology, applied psychology, clinical medicine, and medical ethics. During the program's last 9 to 15 months, students do supervised clinical work designed to develop practitioners' skills. Clinical training begins with a series of clinical practice assignments or rotations. These rotations include family practice, inpatient and ambulatory medicine, general surgery, obstetrics and gynecology, emergency medicine, internal medicine, psychiatry, and pediatrics. Sometimes, one or more of the rotations are served under the "preceptorship" or supervision of a physician who is seeking to hire a PA. This learning experience often leads to a permanent position.

The number of PA programs that award a bachelor's degree has been growing, and currently about two-thirds of the programs do so. Most of the remaining programs offer a certificate and/or associate degree; two lead to a master's degree.

MEDEX programs, which last about 18 months, are slightly shorter than other PA programs. MEDEX programs are designed for people who have had extensive patient-care experience, usually as medical corpsmen or registered nurses. This background allows for a shorter period of classroom training and increased emphasis on clinical experience. MEDEX students usually gain most of their supervised clinical experience working with the physician who will hire them upon graduation.

Postgraduate education for PA's, termed the "PA residency," is a recent development. Residency programs, as yet unaccredited, are available in emergency medicine, general surgery, neonatology, and occupational medicine.

State laws and regulations govern the use of the title "physician assistant" and the scope of PA practice in all but a few States. Most States require that PA's be graduates of accredited educational programs, and 39 States require that PA's be certified by the National Commission on Certification of Physician Assistants, (NCCPA). NCCPA certification attests to clinical knowledge; in 1984, about 13,000 PA's had gained certification.

The PA's scope of practice—the duties he or she may perform—is determined in some States by the supervising physician and in others by the State's regulatory agency. There is considerable variation in State laws and regulations, and changes commonly occur. Aspiring PA's should investigate the laws and regulations where they wish to practice.

Individuals planning a career as a physician assistant should be conscientious and willing to study a great deal throughout their career to keep up with medical advances. They should exhibit leadership, self-confidence, and emotional stability. A pleasant personality, patience, and the ability to deal with all kinds of people are essential.

Formal lines of advancement have not evolved within this young profession. There are no head PA's in hospitals or nursing homes as there are head nurses; by the very nature of the profession, individual PA's are supervised by physicians. Since a supervising physician shares responsibility for the quality of care rendered by the PA, this relationship must be a close one.

Some PA's advance after additional education to practice in a specialty area such as emergency medicine; others advance with experience to added responsibilities and higher earnings, although earnings generally level off within 7 or 8 years after graduation.

Job Outlook

Employment of PA's is expected to grow much faster than the average for all occupations through the mid-1990's. The occupation, though still small, has already experienced extraordinary growth: The number of formally trained PA's was fewer than 100 in 1970.

Over the past decade, as the number of PA's has grown, their role in delivering health care has expanded as well. In the early years, PA's worked mostly in physicians' offices and rural clinics. Although many jobs for PA's continue to be found in private practice, particularly in family practice, PA's work in a variety of settings. (See chart.)

A trend toward practice in institutions is taking hold. A growing number of PA's provide care to medically underserved populations—prison inmates or residents of nursing homes and other long-term care institutions, for example. In addition, hospitals are an increasingly attractive workplace for PA's. Hospitals hire PA's to replace resident physicians and foreign medical graduates as the number of surgical residency programs is reduced and fewer foreign graduates enter the country.

Followup data reveal that nearly all newly trained PA's find work. New graduates may have to accept jobs in medically underserved areas, but they do not view this as a hardship. Most PA students report a preference to practice in a small city or town.

Long-term prospects for PA's are difficult to assess, largely because of unresolved issues in payment for their services. Restrictions on health insurance, Medicare, and other kinds of third-party reimbursement for services provided by PA's is one of the most important questions clouding the profession's future. Studies have established that substituting PA's for some physicians can lower costs without reducing the quality of care. However, the majority of health insurance programs do not pay for services performed solely by a PA. Uncertainty regarding payment makes some physicians reluctant to hire PA's.

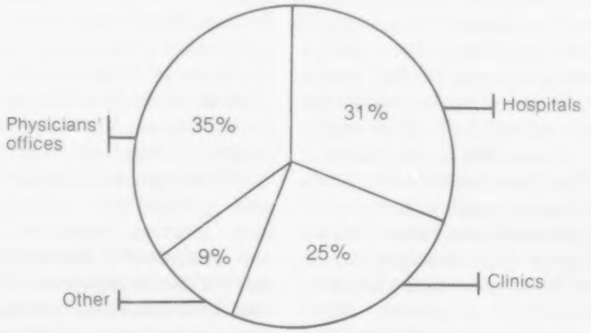
Another unsettling factor is the diversity of State laws that regulate the kinds of services PA's may perform. In some States, they have the authority to make medical decisions and prescribe treatment without the immediate supervision of a physician. In others, they are allowed to practice only where a licensed physician is present. Most States restrict the types of drugs a PA can prescribe, and some States prohibit PA's from writing prescriptions altogether. Furthermore, laws regarding PA practice are under review in some States, where proposals to expand their scope of practice have aroused the opposition of other health providers. Some physicians may be reluctant to hire PA's without knowing what rules will govern their use in coming years.

The now-plentiful supply of physicians affects prospects for PA's. In the early 1960's, the Federal Government took steps to expand the number of graduates from U.S. medical schools. Medical school enrollment has doubled in the past two decades, and the number of physicians in practice has risen sharply. Barring a major surge in demand for medical services, the increasingly abundant supply of physicians is expected to lower patient loads for physicians and possibly decrease the demand for PA's in urban areas.

Some developments could heighten rather than curtail demand for PA's. More doctors are locating in medically underserved areas, which could open up additional employment opportunities for PA's. The growing popularity of health maintenance organizations and other kinds of prepaid health plans is also likely to spur demand. Such plans, which provide complete health care services to members for a set annual charge, employ physican assistants, nurse-midwives,

Physician assistants work in a variety of settings.

Distribution of employment, 1984



SOURCE: American Academy of Physician Assistants and nurse practitioners in place of some physicians. If HMO's take on a significantly expanded role in health care, demand for PA's would undoubtedly rise.

The aging of the population could also affect employment of PA's. Compared to younger people, the elderly visit physicians more often, spend more money on medicine and drugs, and spend much more time in hospitals. Resolution of the third-party reimbursement issue could lead to greater employment of PA's by nursing homes and home health agencies that serve the elderly.

Also affecting the outlook for PA's are enrollments in PA training programs. In recent years, enrollments have leveled off. If enrollments remain stable while demand for PA's continues to grow, job opportunities for these workers should be even more favorable.

Earnings

In 1984, physician assistants starting work in hospitals and medical centers averaged about $20,500, according to a national survey conducted by the University of Texas Medical Branch. Typically, the highest pay for PA's in these settings was about $27,000, although some earned as much as $39,000.

The average salary of PA's in all settings was about $27,500 in 1984. PA's in HMO's, hospitals, and physicians' offices earn slightly more than those in clinics.

Veterans Administration hospitals started PA's at about $17,800 a year in 1985. Average earnings for all federally employed PA's were about $26,400 in 1984.

Related Occupations

Other health workers who provide direct patient care that requires a similar level of skill and training include nurse practitioners, physical therapists, occupational therapists, and speech and hearing clinicians.

Sources of Additional Information

For more information about the profession, send for the brochure, *Physician Assistant*, available free from:

American Academy of Physician Assistants, 1117 North 19th St., Suite 300, Arlington, Va. 22209.

Information on individual PA training programs also is available from:

Association of Physician Assistant Programs, 1117 North 19th St., Suite 300, Arlington, Va. 22209.

The Association's publication entitled *National Directory of Physician Assistant Programs* lists educational programs and describes each program's accreditation status, admission procedures and requirements, and cost. Information on certification requirements is also given. Contact the Association for price and ordering information.

For eligibility requirements and a description of the Physician Assistant National Certifying Examination, write to:

National Commission on Certification of Physician Assistants, Inc., 3384 Peachtree Rd. NE., Suite 560, Atlanta, Ga. 30326.

Recreational Therapists

(D.O.T. 076.124-014)

Nature of the Work

Recreational therapists provide services to people who are mentally, physically, or emotionally disabled. These workers are also known as *therapeutic recreation specialists*, a job title that draws attention to the fact that theirs is a health profession. The work of the recreational therapist should not be confused with that of the recreation worker, who provides recreational activities for the sole purpose of enjoyment. (See the statement on recreation workers elsewhere in the *Handbook*.)

Recreational therapists employ recreational and leisure activities as a form of treatment—much as other practitioners use surgery, drugs, nutrition, exercise, or psychotherapy. Therapists strive to minimize patients' symptoms and to improve their physical, mental, and emotional well-being. Enhancing the patient's ability to function in everyday life is the primary goal of recreational therapy; enjoyable and rewarding activities provide the means for working toward that goal.

Activities employed by recreational therapists are as varied as the interests and abilities of the people they serve. They might, for example, organize athletic events, dances, arts and crafts or musical activities, attendance at movies, field trips, or poetry readings. Apart from sheer enjoyment, activities such as these provide opportunities for exercise and social participation. Other goals that the therapist might have in mind when planning an activity include relieving anxiety, building confidence, or promoting independence.

Recreational therapy is a relatively new field. Closely related to occupational therapy, it shares with that profession a view that activities that seem ordinary to most of us can put disabled persons on the road to recovery—or lead to improvement, at any rate. Together with the "expressive" therapies—art, music, drama, and dance—recreational therapy owes much to the discovery that soldiers suffering from battle fatigue, shock, and emotional trauma responded favorably to organized treatment programs. During World War II, for example, the Veterans Administration (VA) organized medical recreational activities in VA hospitals.

Recreational therapists are found in a variety of settings, including mental hospitals, psychiatric "day hospitals," community mental health centers, nursing homes, adult day care programs, residential facilities for the mentally retarded, school systems, and prisons. They are often located in the activities department or therapy department of an organization. These departments are staffed by therapists and their assistants from several disciplines—occupational therapy, music, dance, and art therapy, to name a few. Together with other health professionals, they assess the patient's functioning, develop a treatment plan, and monitor progress as the plan is carried out. Job responsibilities also include directing the support staff. At times, it is the therapeutic assistant who actually conducts recreational programs and spends the most time with the patients.

The specifics of the recreational therapist's job vary with the employment setting and capacities of the patients or clients served. In a hospital setting, for example, the recreational therapist usually works as a member of a team that may include a physician, nurse, clinical psychologist, social worker, and other rehabilitation professionals. Team members evaluate the patient from the perspective of their various specialties and then develop a coordinated treatment plan.

During the initial session in a hospital therapy department, the recreational therapist might chat with the patient and family to put them at ease before directing the conversation toward the patient's interests, enthusiasms, or hobbies—anything that offers a clue to activities that could be incorporated into a treatment program.

The therapist needs information about the patient's physical, mental, and emotional status in order to set realistic goals and recommend suitable activities. To obtain this information, the therapist pores through medical records, talks with other members of the staff, and observes the patient's behavior. Next, the therapist prepares a list of activities that capitalize on the patient's strengths and interests.

Progress is likely to be slow; sometimes, there is no progress at all. Recreational therapists understand this, and set goals accordingly. A patient who has trouble socializing, for example, may express interest in chess but be overwhelmed by the prospect of actually playing since that involves interaction with another person. The therapist would proceed slowly, first letting the patient observe a game and then assigning a therapeutic assistant to serve as a chess partner for weeks or even months—as long as it took for the patient to gain the confidence to seek out other patients as partners.

Recreational therapists are careful to observe patients' reactions to the activities in which they are involved. The therapist might note, for example, that one patient participates in outdoor activities more enthusiastically than before; another is ready for activities that require teamwork; still another patient, formerly cooperative, has become combative and disruptive. Observations such as these provide the basis for the therapist's periodic review of each patient's activity program. The program is apt to be modified as the patient's condition changes.

Documentation is an important part of the recreational therapist's job. Among the records the therapist must keep are the initial evaluation, progress notes, reports to the physician, internal staff notes, Medicare records, and discharge notes. These records are used to keep track of the patient's condition, document treatment programs, and monitor progress.

In nursing homes, recreational therapists evaluate residents' capabilities much as they do in hospitals. They look at medical records, talk with residents to learn about their interests, and discuss their condition with other members of the staff. Often, the therapist groups residents according to common or shared interests and similar ability levels, and plans field trips, entertainment events, baking, exercise, dancing activities, and the like for the group. The therapist documents residents' responses to the activities and continually searches for ways of heightening residents' enjoyment of recreational and leisure activities, not just in the facility, but in the surrounding community as well.

Because nursing home residents are likely to remain in the facility for months or even years, the activities program makes a big difference in the quality of their lives. Without the stimulation of interesting events, the daily routine of a nursing home can be monotonous and depressing, and residents are apt to deteriorate. In some nursing homes, recreational therapists direct the activities program. In other facilities, activities coordinators plan and carry out the program under the part-time supervision of a consultant who is either a recreational therapist or an occupational therapist.

The recreational therapist in a community setting might work in a day care center for the elderly, for example, or in a program for mentally retarded adults operated by a county recreation department. No matter what the disability, recreational therapists in community settings have a challenging job in pulling together the resources to provide recreational opportunities for disabled persons. Organizational ability, flexibility, and ingenuity are essential. Before an activity such as wheelchair basketball can take place, for example, space must be secured and equipment rented; prospective participants interviewed; and clients, staff, and volunteers advised of timetables and logistics. Because clients generally live at home with their families or in group residential facilities such as halfway houses, transportation to and from the activity site is an important concern. In institutional settings such as hospitals and nursing homes, transportation requires less planning and coordination.

Therapeutic goals are identified before the event takes place. Once the program has been planned and publicized, the therapist interviews each individual who signs up, and may also discuss the upcoming event with the client's physician to be sure that the event is suitable for the client's condition. For example, if the physician indicates that an individual would get very upset in a competitive situation, the therapist may suggest a team event rather than a chess match: Less intense competition may help clients learn how to deal with losing and eventually to gain enough control of their impulses to participate in more competitive activities. In addition, the therapist acts as the leader of these events and many times supervises assistants as well.

Working Conditions

Working conditions vary according to the employment setting, facilities available, and the activity being implemented. In a clinical setting, for example, recreational therapists might work directly in a hospital ward or a spacious activity room. In a nursing home, the recreational therapist might work in a room equipped with arts and crafts materials.

In a community setting, the recreational therapist is likely to be in several different places in the course of a day or a week. Interviewing clients and planning events take place in an office, but when leading activities, the therapist might be in a gymnasium, outdoors on a nature walk, or in a swimming pool.

In general, recreational therapists work in well-lighted, well-ventilated areas. The job may be physically tiring because therapists often are on their feet all day. Recreational therapists generally work a standard 40-hour week, although weekend and evening hours occasionally are required. Therapists holding supervisory positions may be required to work overtime depending upon the workload.

Employment

Recreational therapists held about 17,000 jobs in 1984. Many of the jobs were in rehabilitation, psychiatric, and other specialty hospitals. Other employers of recreational therapists include general hospitals, nursing homes, community mental health centers, adult day care programs, school systems, residential facilities for the mentally retarded, and a variety of community programs for people with disabilities.

A small number of therapists are self-employed, providing recreational therapy services on a contract basis, for the most part. A self-employed therapist might develop and oversee activities programs for several small nursing homes or community programs, for example.

Training, Other Qualifications, and Advancement

A degree in therapeutic recreation, or in recreation with an emphasis on therapeutic recreation, is the usual requirement for professional positions in this field. An associate degree satisfies hiring requirements in many nursing homes, while a bachelor's degree ordinarily is necessary in community and clinical settings.

Hiring requirements are changing. In the past, individuals with degrees in psychology, sociology, social work, and other human service fields found jobs as recreation therapists. Increasingly, however, formal preparation in therapeutic recreation is expected. Individuals without such preparation are likely to be hired as therapeutic assistants rather than as therapists.

Three States—Georgia, Maryland, and Utah—regulate the practice of recreational therapy. Georgia and Utah have licensure requirements, while Maryland requires recreational therapists in long-term care facilities to be certified (or eligible for certification).

Certification is available through the National Council for Therapeutic Recreation Certification (NCTRC), which awards credentials for therapeutic recreation specialists and therapeutic recreation assistants. Many employers prefer to hire certified recreational therapists; some insist on the NCTRC credential.

More than 160 accredited programs in recreational therapy are offered at the college or university level. Most of these are bachelor's degree programs, although some are associate or master's degree programs. There are a few doctoral programs in therapeutic recreation.

Entry level preparation for a job as a recreational therapist is available at both the bachelor's and master's level. Associate degree programs do not ordinarily lead to therapist jobs. Instead, graduates qualify for hospital jobs as therapeutic assistants, or for nursing home jobs as activities specialists. A graduate degree is generally required for teaching, research, and administrative positions in this field.

Helping patients enjoy themselves is an important part of a recreational therapist's job.

Academic programs in therapeutic recreation emphasize coursework in the physical, biological, and behavioral sciences and require 360 hours of internship under the supervision of a certified therapeutic recreation specialist.

To put disabling and handicapping conditions into context, these programs provide a solid foundation in human anatomy and physiology. They deal with society's response to disability as well as biological, psychological, and social consequences for the disabled individual. In the realm of professional practice, courses deal with programming for special populations; assessment and referral procedures; assistive techniques including self-help skills, signing, and orientation and mobility; adaptive devices and medical equipment; current treatment approaches; legal issues in delivering services to special populations; and professional ethics.

Persons considering this career must be able to work with people of all ages, temperaments, and personalities. To gain patients' confidence, it is necessary to have a warm, friendly personality that inspires both trust and respect. In addition to these qualities, it is necessary to have ingenuity and imagination in adapting activities to individual needs. The potential therapist must be skilled, patient, and resourceful in teaching and dealing with patients.

Newly graduated recreational therapists generally begin as staff therapists. Advancement is chiefly to supervisory or administrative positions. Some therapists teach, conduct research, or do consulting work on a contract basis.

Job Outlook

Employment of recreational therapists is expected to grow faster than the average for all occupations through the mid-1990's due to anticipated growth in the areas of rehabilitation and long-term care.

Future changes in the size and age structure of the population mean that there will be many more people with disabilities in 1995 than there are today. Substantial growth is expected for the population age 85 and above, an age group that suffers a very high incidence of disabling conditions. Because of better health care, people with developmental disabilities such as Down's syndrome are living longer than they used to, so the number of mentally retarded persons is expected to grow. Significant growth is also projected for the mentally ill, in part because of the very large number of young adults who have reached the age of peak risk for schizophrenia and other chronic mental illnesses.

Public and private response to the needs of older people is expected to spur rapid employment growth in nursing homes, retirement and life care communities, adult day care programs, and social service agencies. In the areas of mental health and mental retardation, continued support for deinstitutionalizing residents of large public facilities is expected to create strong and sustained pressure, at State and local levels, for community residences and programs for the physically and mentally disabled.

Hospitals will account for practically none of the projected employment increase, and most job openings in hospitals will be generated by the need to replace experienced workers who transfer to other occupations or stop working.

In the large public mental hospital sector, for example, little job growth is foreseen because of constraints on State government spending and continued support for the policy of deinstitutionalization. If current trends persist, private psychiatric hospitals will diverge from the rest of the hospital sector and register rapid employment growth. Among the reasons for this are broad third-party coverage for acute inpatient psychiatric care; growing public acceptance of formal treatment for drug abuse and alcoholism; and lessening of the stigma attached to receiving mental health care. Job prospects for recreational therapists in private psychiatric facilities should be favorable, although it is important to bear in mind that this specialty sector is small.

Slow growth in the hospital sector will be more than offset, however, by burgeoning demand for recreational therapists in nursing homes, community programs, and residential facilities for people with handicapping conditions. Demographic trends and industry expansion are the main reasons for very rapid growth in recreational therapy jobs in the nursing home sector. Growth could be even more rapid than currently anticipated, depending on future developments in nursing home staffing. A broad-based effort to improve the quality of care in nursing homes would undoubtedly lead to additional jobs for recreational therapists, since there is general agreement that well-designed activities programs promote residents' physical and mental health. Quality of nursing home care is the subject of attention at all levels of government, but it is impossible to predict whether public concern will produce pressure for staffing changes.

Community programs for special populations are expected to expand significantly in the years ahead. Locating a job may require persistence, however, in view of the small scale and developmental nature of community-based programs. Internships may prove especially valuable for students interested in community practice. In recreational therapy, as in other human service fields, internships and volunteer work provide contacts that may prove invaluable in finding a job.

Job prospects are expected to be favorable for graduates of accredited programs in therapeutic recreation. Currently, there are reports of a shortage of qualified recreational therapists in some areas, rural areas in particular. In metropolitan areas and localities where training programs abound, competition for jobs is keener.

Earnings

Salaries of recreational therapists vary according to employment setting, educational background, work experience, and region of the country. Starting salaries for recreational therapists in institutions and programs funded by State mental health or mental retardation agencies ranged from $14,500 to $19,500 a year in 1985, according to a survey by the National Theraputic Recreation Society. The starting salary for theraputic recreation specialists in Veterans Administration facilities was $17,824 a year in 1985.

Recreational therapists employed by hospitals, medical schools, and medical centers had average starting salaries of $17,000 a year in 1984, according to a survey by the University of Texas Medical Branch. Top salaries of experienced recreational therapists averaged $23,400.

Related Occupations

Recreational therapists design activities to help people with disabilities lead more fulfilling and independent lives. Other workers who have similar jobs are orientation therapists for the blind, art therapists, drama therapists, dance therapists, music therapists, occupational therapists, and rehabilitation counselors.

Sources of Additional Information

For information about careers in recreational therapy, contact:

National Therapeutic Recreation Society, 3101 Park Center Dr., Alexandria, Va. 22302.

Certification information may be obtained from:

National Council for Therapeutic Recreation Certification, P.O. Box 16126, Alexandria, Va. 22302.

Academic programs in therapeutic recreation are listed in the National Recreation and Park Association's *Directory of College/University Programs in Recreation, Leisure Services and Resources*. The latest edition may be purchased from:

NRPA, 3101 Park Center Dr., Alexandria, Va. 22302.

The American Association of Health, Physical Education, Recreation, and Dance also publishes a directory listing academic programs in therapeutic recreation. For price and ordering information, contact:

AAHPERD, P.O. Box 704, Waldorf, Md. 20601.

For a pamphlet on careers in mental health, write:

Public Inquiries, National Institute of Mental Health, 5600 Fishers Lane, Rockville, Md. 20857.

For a pamphlet on careers in nursing homes, write:

American Health Care Association, 1200 15th St. NW., Washington, D.C. 20005.

Information about employment opportunities in Veterans Administration medical centers is available from local VA medical centers.

Registered Nurses

(D.O.T. 075.124-010 and -014, .127-014, -018, -022, -026, and -030, .137-010, .264-010 and -014, .371-010, .374-010, -014, -018, and -022)

Nature of the Work

Registered nurses (R.N.'s) handle a variety of tasks related to both health and illness. Typically concerned with the "whole person," registered nurses deal with patients' mental and emotional functioning as well as their physical needs. They observe, assess, and record symptoms, reactions, and progress; administer medications; assist in convalescence and rehabilitation; instruct patients and their families in proper care; and help individuals and groups take steps to improve or maintain their health. The work setting determines the scope of the nurse's responsibilities.

Hospital nurses constitute by far the largest group of nurses. Most are staff nurses who provide skilled bedside nursing care and carry out the medical regimen prescribed by physicians. They may also supervise licensed practical nurses, aides, and orderlies. Hospital nurses usually work with groups of patients who require similar nursing care. For instance, some nurses work with patients who have had surgery; others care for children, the elderly, or the mentally ill.

Registered nurses working in nursing homes provide bedside nursing care to patients convalescing from surgery or an illness, and to those suffering from chronic illnesses and disabilities. They also supervise licensed practical nurses and nursing aides.

Private duty nurses give individual care to patients who need constant attention. They may work in a home, a hospital, or a nursing home or rehabilitation center.

Community health nurses care for patients in clinics, schools, retirement and life care communities, and other community settings. A growing number provide home health care. They instruct patients and families in health care and give periodic care as prescribed by a physician. They may instruct community groups in proper nutrition and exercise and arrange for immunizations, blood pressure testing, and other health screening measures. These nurses work with community leaders, teachers, parents, and physicians in community health education. Some community health nurses work in schools.

Office nurses assist physicians, dental surgeons, and, occasionally, dentists in private practice, clinics, and health maintenance organizations. Sometimes they perform routine laboratory and office work in addition to their nursing duties.

Occupational health or industrial nurses provide nursing care to employees in industry and government and, along with physicians, promote employee health. As prescribed by a doctor, they treat minor injuries and illnesses at work, provide needed nursing care, arrange for further medical care if necessary, and offer health counseling. They also may assist with health examinations and inoculations.

Working Conditions

Nurses generally work indoors in well-lighted, comfortable buildings. Community health nurses may be required to travel to patients in all types of weather. For those nurses who care for the ill and infirm, the physical demands of patient care can be strenuous. Nurses in general need physical stamina because they spend considerable time walking and standing. When treating patients with infectious diseases such as hepatitis and AIDS, nurses must rigidly adhere to guidelines regarding cleanliness and sterility. Emotional stability is required to cope with human suffering and frequent emergencies. Because patients in hospitals and nursing homes require care at all times, staff nurses in these institutions may have to work nights, weekends, and holidays.

Employment

Registered nurses held about 1,377,000 jobs in 1984. Two out of three jobs were in hospitals, as the following tabulation shows:

	Percent
Total	100
Hospitals	69
Offices of physicians (M.D.'s and D.O.'s)	7
Government	7
Nursing and personal care facilities	6
Educational services	3
Personnel supply services	3
Health and allied services not elsewhere classified	2
Outpatient care facilities	1
Other	2

Between one-fourth and one-third of all nursing jobs are part time.

Training, Other Qualifications, and Advancement

To obtain the license to practice that is required by all States and the District of Columbia, nurses must graduate from an approved school of nursing and pass a national examination administered by each State. Nurses may be licensed in more than one State, either by examination or endorsement of a license issued by another State. Some States require continuing education for license renewal.

In 1984, about 1,477 nurse training programs were offered in the United States. In addition, 154 master's degree and 31 doctoral degree programs provided advanced education in nursing.

Nursing training programs vary in length from 2 to 5 years after graduation from high school, depending on the nature of the program. Programs offered by community and junior colleges take about 2 years and lead to an associate degree; hospital-based programs last 3 years and lead to a diploma; college and university programs require 4 or 5 years and lead to a baccalaureate degree.

There is considerable controversy about the relative merits of the various nurse training programs. Some employers have specific preferences, but, with few exceptions, graduates of all these programs qualify for entry level staff nurse positions after passing the licensing examinations.

Job prospects for registered nurses are expected to be highly favorable.

Individuals considering a career in nursing should bear in mind that the kind of program they choose—associate, diploma, or bachelor's degree—will affect their future opportunities. For supervisory or administrative positions, for jobs in public health agencies, and for admission to graduate nursing programs, for example, a bachelor's degree in nursing is necessary. Those considering research, consulting, teaching, or a clinical specialization also should start their nursing education in a bachelor's program.

Some R.N.'s trained in diploma or associate degree programs subsequently enter baccalaureate degree programs to prepare for a broader scope of nursing practice, but this can be a costly and time-consuming way of securing baccalaureate level preparation.

All nurse training programs include classroom instruction and supervised nursing practice in hospitals and other health facilities. Students take courses in anatomy, physiology, microbiology, nutrition, psychology, and nursing. Increasingly, nursing students learn the latest clinical and administrative uses of computers in medicine. In hospitals, for example, nurses routinely use computers to enter or retrieve information about patients such as X-rays, laboratory test results, or medication orders.

Nursing students also receive supervised clinical experience in various hospital departments—pediatrics and surgery, for example. Students in bachelor's degree programs as well as in some of the other programs are assigned to public health departments, visiting nurse associations, and other community agencies to learn how to care for patients in clinics and in patients' homes. Varying amounts of general education are combined with nursing education in all three types of programs.

Persons who want to pursue a nursing career should have a sincere desire to serve humanity and be sympathetic to the needs of others. Nurses must be able to accept responsibility and direct or supervise the activity of others; they must have initiative, and in appropriate situations be able to follow orders precisely or determine if additional consultation is required; and they must use good judgment in emergencies.

From staff positions in hospitals, experienced nurses may be promoted to increasingly responsible jobs, many of which can be obtained through experience and good performance. For nurses who choose a career in management, advancement can include the assistant head nurse or head nurse position. From there, assistant director, director, and vice president positions are possible. Increasingly, positions at the management level require a graduate degree in nursing or health services administration, with emphasis on finance. Executive level nursing positions require business judgment and strong negotiation skills. Graduate programs are offered in colleges or universities and usually last 1-2 years. Applicants must be R.N.'s, preferably with some experience in beginning management.

For nurses who prefer close contact with patients, career advancement may mean becoming a clinical nurse specialist, nurse practitioner, nurse clinician, or nurse anesthetist. Graduate level preparation is necessary to reach these positions, all of which are distinguished by the ability to exercise a high degree of independent judgment in assessing nursing problems and determining priorities of care. Training is offered in hospitals and universities, normally lasts 1-2 years, and leads to a certificate or master's degree. Applicants must be R.N.'s and many programs require up to 2 years of nursing experience in a relevant specialty.

Nurse anesthetists complete a certificate program allowing them to administer anesthesia under the direction of a physician. Nurse practitioners and nurse midwives have graduate level training in diagnostic and health assessment skills that enables them to perform certain duties normally performed by a physician. Clinical nurse specialists and nurse clinicians have expertise in a clinical area such as pediatrics or gerontology/geriatrics which usually is obtained through completion of a master's degree program.

A growing number of nurses are moving into the business side of health care. Their nursing expertise and training to work as members of a team prepare them for management positions in fields such as ambulatory, acute, and chronic care services. Some are employed by large health care corporations in areas like health planning and development, marketing, and quality assurance. Others run their own businesses, such as home health care agencies.

Job Outlook

Employment of registered nurses is expected to rise much faster than the average for all occupations through the mid-1990's in response to the health care needs of a growing and aging population.

The rapidly growing demand for registered nurses is in part a function of their training, which permits them to work effectively in a wide variety of roles and employment settings. Over the years, staffing patterns for hospital nursing personnel have shifted in the direction of greater reliance on registered nurses and less use of licensed practical nurses and nursing aides. The growth of intensive care, coronary care, and other special units for seriously ill patients has spurred demand for clinically specialized nursing personnel. Such nurses are equipped to handle the highly sophisticated equipment used in hospitals.

The trend toward greater reliance on registered nurses is expected to accelerate because of prospective payment, Medicare's new system of paying for hospital care. Substitution of registered nurses and "multicompetent" technicians for allied health workers is likely to occur in some hospitals. In addition, registered nurses will be sought for technically demanding but "generalist" responsibilities in the rapidly growing outpatient care sector. They may be preferred over more specialized personnel for jobs in health maintenance organizations, ambulatory surgery centers, group medical practices, and other outpatient settings.

The home is an increasingly important practice site, not only because of changes in the way treatment is provided in hospitals, but because of the prevalance of functional disabilities among older persons and consumer preference for care in home or community-based settings. The home health field is expected to experience spectacular growth by the mid-1990's, and should provide excellent opportunities for R.N.'s.

The nursing home sector—a major employer of registered nurses—is also expected to expand due to the projected increase in the number of elderly people requiring this level of care. In addition, cost containment pressures on hospitals to release patients as soon as possible will require nursing home care for those recovering from surgery, stroke, or other major episodes. Patients such as these will stay in the nursing home for a relatively brief time, but they will require intensive services—intravenous therapy, feeding tubes, and respirator support—that necessitate advanced nursing skills. Job opportunities for R.N.'s in nursing homes should be excellent, especially in view of the chronic shortage of nurses experienced by many facilities.

The supply of registered nurses is roughly in balance with demand at present, although there are shortages in certain areas—in rural communities, big city hospitals, and such specialties as geriatrics. At the same time, competition is expected to persist for the more desirable, higher paying jobs, especially in areas considered highly attractive because of climate or recreational or cultural facilities, and in areas where training programs abound. Nurses with a bachelor's degree should have the best prospects in those areas.

Overall, job opportunities for nurses during the coming decade will reflect the interplay of demand and supply, and a highly favorable job market seems likely. Recent graduates of nursing school are a major source of supply for the profession. The number of new graduates is expected to decline by the mid-1990's, although demand is projected to burgeon. In settings or communities that experience a shortage of nurses, employers are likely to respond with higher pay and other incentives designed to attract licensed R.N.'s not currently active in the field. Some are at home caring for families; others have transferred to other kinds of jobs. Supply might also be augmented by R.N.'s who reinstate their licenses in order to return to work, and by part-time workers who switch to full time.

Earnings

Median annual earnings of registered nurses who worked full time in 1984 were about $21,000. The middle 50 percent earned between about $18,000 and $26,000. The lowest 10 percent earned about $15,000 or less. The top 10 percent, many of whom probably were head or supervisory nurses, earned more than $31,000.

RN staff nurses in nursing homes had median annual salaries of approximately $17,300 in 1984, according to a survey by the Hospital Compensation Service.

In 1985, the Veterans Administration paid inexperienced nurses who had a diploma or an associate degree a starting salary of $16,040 a year; those with a bachelor's degree, $18,763. Nurses employed in all Federal Government agencies earned an average of about $24,500 in 1984.

Starting salaries of registered nurses employed in hospitals, medical schools, and medical centers averaged about $18,800 a year in 1984, according to a national survey conducted by the University of Texas Medical Branch. Experienced R.N.'s averaged about $25,300. This survey also showed that head nurses averaged starting salaries of about $23,100; salaries for experienced head nurses averaged $30,600. Beginning nurse anesthetists averaged $28,200; those with experience, $37,300.

Registered nurses in home health agencies had average salaries of about $17,500 a year in 1983, according to a Home Care Agency Survey conducted by the Select Committee on Aging of the U.S. House of Representatives.

Most hospital and nursing home nurses receive extra pay for work on evening or night shifts. Nearly all receive from 5 to 13 paid holidays a year, at least 2 weeks of paid vacation after 1 year of employment, and health and retirement benefits.

Related Occupations

Other occupations with responsibilities and duties similar to those of registered nurses include: Occupational therapists, paramedics, physical therapists, physician assistants, and respiratory therapists.

Sources of Additional Information

The National League for Nursing (NLN) publishes a variety of materials about nursing and nursing education, including a list of approved schools of nursing and information on student financial aid. One brochure describes master's degree programs to prepare nurse practitioners, clinical specialists, and nurse educators. For a complete list of NLN publications, write for a career information brochure. Send your request to:

Communications Department, National League for Nursing, 10 Columbus Circle, New York, N.Y. 10019.

Information on career opportunities as a registered nurse is available from:

American Nurses' Association, 2420 Pershing Rd., Kansas City, Mo. 64108.

Information about employment opportunities in Veterans Administration medical centers is available from local Veterans Administration medical centers and also from:

Recruitment and Placement Service, Veterans Administration, 810 Vermont Ave. NW., Washington, D.C. 20420.

For information on nursing careers in hospitals, contact:

American Hospital Association, Division of Nursing, 840 North Lake Shore Dr., Chicago, Ill. 60611.

For a copy of *Health Careers in Long-Term Care*, write:

American Health Care Association, 1200 15th St. NW., Washington, D.C. 20005.

Respiratory Therapists

(D.O.T. 079.361)

Nature of the Work

Respiratory therapists treat patients who have cardiopulmonary (heart-lung) problems that interfere with breathing. Treatment may range from giving temporary relief to patients with chronic asthma or emphysema to emergency care for heart failure, stroke, drowning, or shock. Respiratory therapists are among the first specialists called for emergency treatment of acute respiratory conditions arising from head injury or drug poisoning. Their role is a highly responsible one because a patient who stops breathing for longer than 3 to 5 minutes has little chance of recovery without serious brain damage. If oxygen is cut off for more than 9 minutes, death results.

Respiratory care usually involves one or more of the four major kinds of treatment: Administering oxygen and oxygen mixtures; using humidity and aerosol mists to keep the respiratory tract moist or to deliver medication; administering chest physical therapy, which includes exercises to reduce the effort of breathing, as well as tapping and coughing procedures to help clear the lungs; and operating mechanical ventilators that replace or assist natural breathing. Mechanical ventilators help sustain life when a patient is unable to breathe spontaneously. This may happen for a number of reasons—because a patient is in a coma, for example, or has paralysis of the respiratory muscles, severe lung, head, or chest injury, or damage from smoke inhalation.

Respiratory therapists set up, operate, and monitor special equipment, including ventilators, positive pressure breathing machines, and oxygen tents. They help with a variety of diagnostic procedures to determine the levels of oxygen and carbon dioxide in the blood, the volume of air taken into the lungs, and so on. They also administer treatments such as bronchopulmonary drainage and breathing exercises.

Respiratory therapists often treat patients who have undergone surgery; anesthesia depresses respiration, so respiratory therapy may be prescribed to restore full, deep breathing and protect the patient against respiratory illness that could complicate recovery. In addition, respiratory therapists commonly treat patients with chronic obstructive pulmonary diseases such as emphysema, bronchitis, and asthma. Such diseases are a major cause of illness and death in the United States.

Providing respiratory care at home is a rapidly expanding area of practice. Respiratory therapists have long administered oxygen to patients in their homes. Increasingly, however, mechanical ventilators and other sophisticated life support systems are being used in the home. Therapists show patients and their families how to use the equipment. Many of the people who receive home respiratory care will need it for the rest of their lives. They can be taught how to operate complex equipment themselves, with several visits a month from respiratory therapists to inspect or clean the equipment and ensure its proper use.

Respiratory care is moving into new areas, notably cardiac care, and a growing number of respiratory therapists are being cross-trained in pulmonary and cardiac procedures.

Other duties include keeping records of the cost of materials and charges to patients, and maintaining and making minor repairs to equipment. Some therapists teach or supervise other respiratory therapy personnel.

Working Conditions

Respiratory therapists generally work a 40-hour week. Because hospitals operate around the clock, therapists may be required to work evenings or weekends. Respiratory therapists spend long periods standing and, in an emergency, may work under a great deal of stress. Gases used by respiratory therapists are potentially hazardous because they are used and stored under pressure. However, adherence to safety precautions and regular maintenance and testing of equipment minimize the risk of injury.

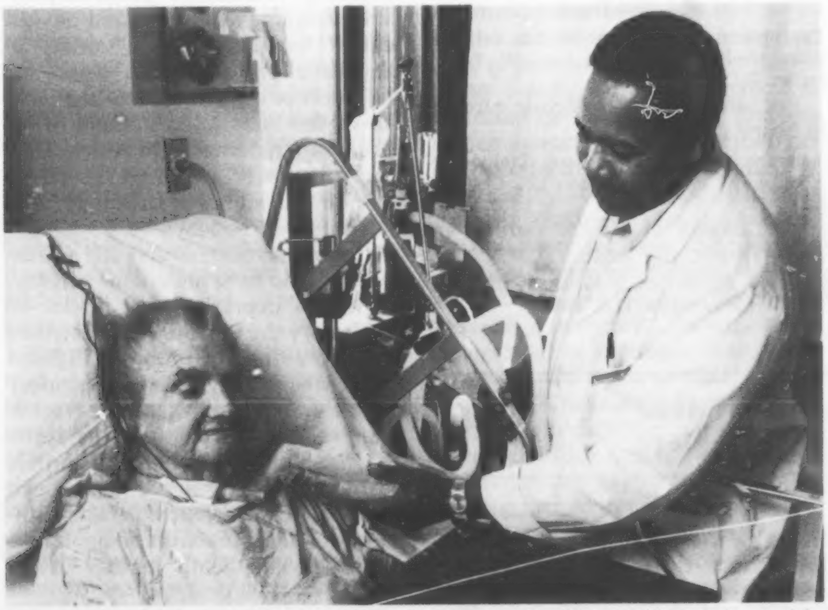
Employment

Respiratory therapists held about 55,000 jobs in 1984. About 9 out of 10 jobs were located in hospitals in departments of respiratory care, anesthesiology, or pulmonary medicine. Oxygen equipment rental companies, ambulance services, nursing homes, and home health agencies accounted for most of the remaining jobs.

Training, Other Qualifications, and Advancement

Respiratory care equipment has become more complex in recent years, and formal training is increasingly important for entry to the field. Voluntary certification is available through the National Board for Respiratory Care. Many employers consider such certification important in choosing among candidates. Several States require respiratory therapy workers to be licensed.

Training for respiratory therapy is offered at the postsecondary level in hospitals, medical schools, colleges and universities, trade schools, vocational-technical institutes, and the Armed Forces. In 1984, about 220 programs in respiratory therapy were accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association. Another 178 programs offered CAHEA-accredited preparation for respiratory therapy technicians.



The growing number of patients with cardiopulmonary problems will spur demand for respiratory therapists.

Formal training programs vary in length and in the credential or degree awarded. About 23 of the CAHEA-accredited therapist programs are 4-year programs that lead to a bachelor's degree; most of the others are somewhat shorter in length and lead to an associate degree. Technician courses usually last about 1 year and graduates are awarded certificates. Areas of study for both types of programs include human anatomy and physiology, chemistry, physics, microbiology, and mathematics. Technical courses deal with procedures, equipment, and clinical tests.

People who want to enter this field should enjoy working with people and should be sensitive to patients' physical and psychological needs. Respiratory therapy workers must pay attention to detail, follow instructions, and work as part of a team. Operating complicated respiratory therapy equipment requires mechanical ability and manual dexterity.

High school students interested in a career in respiratory care are encouraged to take courses in health, biology, mathematics, and physics, for a working knowledge of science and math is essential. Respiratory care involves basic mathematical problem-solving—an ability to use percentages, fractions, logarithms, exponents, and algebraic equations, and a knowledge of the English and metric systems of measuring. Calculus is not required but is helpful. An understanding of chemical and physical principles such as general gas laws, the states of matter, chemical reactions at the atomic level, and the periodic table is also important. Computing medication dosages and calculating gas concentrations are just two examples of the need for knowledge of science and mathematics.

Respiratory therapy technicians and assistants can advance to the therapist level by taking the appropriate courses. Some technicians work part time while studying to be therapists.

Respiratory therapists advance in clinical practice by moving from care of "general" to "critical" patients. Extra skills are needed to judge the condition of patients with problems in other organ systems (heart, kidney, etc.) as well as in breathing. Therapists require the ability to combine breathing care with many other nursing and medical functions.

Therapists may also advance into supervision and management positions and, with additional academic training or experience, may direct the respiratory therapy department. Credentials as a Registered Respiratory Therapist (RRT) often are required for administrative positions.

The field of education also offers opportunities for career development. Jobs for hospital "in-service" educators are widely available, especially for therapists with skills or training in teaching. Many therapists have found careers as instructors in respiratory therapy education programs; with additional academic preparation, they are eligible to advance up the line to professor or program director.

Job Outlook

Employment of respiratory therapists is expected to grow faster than the average for all occupations through the mid-1990's, despite pressures to curb the rising cost of health care and a marked slowing of job growth in hospitals. Public support for high quality care, technological advances in the diagnosis and treatment of respiratory disease, and the increasing incidence of cardiopulmonary diseases such as emphysema are the major factors contributing to anticipated growth in this occupation. In addition, the rate of surgery is on the rise, particularly among the rapidly growing population 65 years of age and older.

An acceleration of the trend toward outpatient surgery, together with a change in the amount and kind of respiratory care delivered in hospitals, could cause employment of respiratory therapists to grow more slowly than currently anticipated. The latter is a strong possibility, for medical opinion as to the treatment value of the various forms of respiratory care is mixed, and hospital administrators and third-party payers (chiefly Medicare, Medicaid, and insurance companies) are expected to try to limit the use of respiratory care to situations where it is clearly appropriate and beneficial. Pressures to cut labor costs may lead some hospitals to alter staffing patterns—replacing respiratory therapists with respiratory therapy technicians, registered nurses, or cardiopulmonary technicians, for example.

Home health care is a bright spot on the horizon, but it is important to bear in mind that this very rapidly growing field accounts for a relatively small share of respiratory therapy jobs. Opportunities in respiratory care should be highly favorable through the mid-1990's in home health agencies, equipment rental companies, and firms that provide respiratory care on a contract basis. Hospital-based home health programs will provide excellent job prospects, too. As in other occupations, however, most job openings will result from the need to replace workers who transfer to other jobs or stop working altogether.

Earnings

The starting salary of respiratory therapists employed in hospitals averaged about $17,136 a year in 1984, according to a survey by the University of Texas Medical Branch. Experienced respiratory therapists in hospitals earned an average salary of $23,100 a year in 1984.

In 1985, the Federal Government paid respiratory therapists with 2 years of CAHEA-accredited postsecondary school training starting salaries of about $13,000.

Respiratory therapy workers in hospitals receive the same benefits as other hospital personnel, including health insurance, retirement benefits, vacations, and sick leave. Some employers provide tuition assistance and other educational benefits, uniforms, and parking.

Related Occupations

Respiratory therapy workers, under the supervision of a physician, administer respiratory care and life support to patients with heart and lung difficulties. Other workers who care for, treat, or train people to improve their physical condition include: Dialysis technicians, emergency medical technicians, licensed practical nurses, registered nurses, occupational therapists, and physical therapists.

Sources of Additional Information

Information concerning a career in respiratory care is available from:

American Association for Respiratory Therapy, 1720 Regal Row, Suite 112, Dallas, Tex. 75235.

Information on gaining credentials as a respiratory therapy worker can be obtained from:

The National Board for Respiratory Care, Inc., 11015 West 75th Terrace, Shawnee Mission, Kans. 66214.

For the current list of CAHEA-accredited educational programs for respiratory therapy occupations, write:

Joint Review Committee for Respiratory Therapy Education, Suite 200, 1701 W. Euless Blvd., Euless, Tex. 76040.

Many respiratory therapy workers receive formal training in hospitals, vocational-technical institutes, private trade schools, and other noncollegiate settings. Local hospitals can provide information on training opportunities for this and other health occupations.

Speech Pathologists and Audiologists

(D.O.T. 076.101 and .107)

Nature of the Work

Almost 1 American in 10 is unable to speak or hear clearly. Speech, language, and hearing impairments can hinder communication and cause problems throughout life. Children who have difficulty speaking, understanding language, or hearing cannot participate fully with others in play or classroom activities. Sometimes these children are thought to have mental or emotional problems, when in fact the problem is language or hearing. Adults with speech, language, or hearing impairments may have problems on the job, and withdraw socially to avoid frustration and embarrassment. Old age almost invariably brings some degree of hearing loss. Severe loss, if not treated, can result in diminished pleasure in everyday activities, social isolation, and—even worse—wrongful labeling of elderly people as "confused."

Speech pathologists and audiologists assist people such as these by evaluating their speech, language, or hearing abilities and providing treatment. Speech pathologists work with those who have communicative disorders resulting from total or partial hearing loss, brain injury, cleft palate, voice pathology, learning disabilities, mental retardation, emotional problems, foreign dialect, or other causes. Audiologists assess and treat hearing problems, sometimes by fitting and dispensing hearing aids. However, speech and hearing are so interrelated that, to be competent in one of these fields, one must be familiar with both.

The duties of speech pathologists and audiologists vary with education, experience, and place of employment. In clinics, such as those in schools and hospitals, they use diagnostic procedures to identify and evaluate speech, language, and hearing disorders. Then, in cooperation with physicians, psychologists, physical therapists, and counselors, they develop and implement an organized program of therapy. Those in school systems generally have other duties as well. They work with administrators in developing programs, counsel parents on prevention, and assist teachers with classroom activities to develop oral communication skills.

Although most speech pathologists and audiologists do some administrative work, directors of clinics and coordinators of speech, language, and hearing in schools, health departments, or other government agencies may be totally involved in administration.

Working Conditions

Work is generally performed in clean, comfortable surroundings, and speech pathologists and audiologists spend most of their time at a desk or table. Although the job is not physically demanding, the close attention to detail and intense concentration needed can be mentally exhausting. A great deal of satisfaction can be gained from seeing a client improve. Lack of progress, on the other hand, can be very frustrating.

Employment

Speech pathologists and audiologists held about 47,000 jobs in 1984. Over two-thirds of these jobs were in elementary and secondary schools and colleges and universities. Speech, language, and hearing centers, hospitals, nursing homes, and offices of physicians employed most of the remainder.

A relatively small number of speech pathologists and audiologists are in private practice. Some are solo practitioners who operate their own offices, while others are in multispecialty group practices or consulting firms. They typically see patients referred to them by physicans or other health practitioners.

Training, Other Qualifications, and Advancement

A master's degree in speech-language pathology or audiology is the standard credential in this field. Medicare, Medicaid, and other third-party payers, for example, pay for speech-language pathology services only if they are provided by a licensed practitioner (licensure requires a master's degree). For reimbursement in States that do not have licensure laws, Medicare and Medicaid require a master's degree and completion or participation in 300 hours of supervised clinical experience.

Speech and hearing specialists in public schools must have a practice certificate issued by the State educational agency. While some States permit individuals with a bachelor's degree in speech pathology or audiology to practice in public schools, they may be classified as special education teachers rather than speech pathologists or audiologists.

In 36 States, licenses are required for those offering speech pathology and audiology services in private practice, clinics, or other settings outside of schools. Although licensure requirements vary somewhat, all States require graduation from a master's degree program in speech-language pathology or audiology, 300 hours of supervised clinical experience, and an examination.

About 235 colleges and universities offered master's or Ph.D. programs in speech-language pathology and audiology in 1985. Approximately two-thirds of the master's degree programs were accredited by the American Speech-Language-Hearing Association (ASHA). Courses include advanced anatomy and physiology of the areas involved in hearing, speech, and language; acoustics; psychological aspects of communication; and analysis of speech production, language abilities, and auditory processes. Graduate students also take courses in the evaluation and treatment of speech, language, and hearing disorders and receive supervised clinical training in communicative disorders.

Most individuals with a master's degree acquire the Certificate of Clinical Competence (CCC) offered by the American Speech-Language-Hearing Association. To earn the CCC, a person must have a master's degree or its equivalent, complete a 9-month internship, and pass a national written examination.

Speech pathologists and audiologists should be able to approach problems objectively and have a concern for the needs of others. They also should have considerable patience and compassion, because a client's progress often is slow. In addition, they should be able to work with detail, to accept responsibility, to

Industrial audiologist testing a worker's hearing.

work independently, and to direct others.

Job Outlook

Employment of speech pathologists and audiologists is expected to increase about as fast as the average for all occupations through the mid-1990's. Anticipated changes in the size and age structure of the population will mean a substantial increase in the number of people with communicative disorders. Because hearing loss is strongly associated with old age, very rapid growth in the population age 75 and above will cause the number of hearing-impaired persons to skyrocket by 1995.

While the aging of the population is expected to spur job growth, it is important to understand that clinical need alone does not govern demand. Other factors that will influence job growth through 1995 include the degree to which the public seeks treatment for speech and hearing disorders; the extent of referrals from family members, teachers, nurses, physicians, and others; the price of speech and hearing services; ability to pay for them, whether out of pocket or through third-party reimbursement; legal mandates requiring services for the handicapped; and the impact of health care cost containment measures.

Substantial growth in the number of speech pathologists and audiologists in school systems has already occurred in response to the Education for All Handicapped Children Act of 1975. Consequently, little job growth is foreseen in elementary and secondary schools, which presently provide the majority of jobs in this field. This reflects anticipated enrollment trends, as well as the availability of special education teachers, who provide some speech and hearing services.

Hospitals, nursing homes, rehabilitation centers, and home health agencies are expected to provide nearly half the new jobs in this field through 1995, in response to projected demand for rehabilitation and long-term care services. Contributing to employment growth in this area, for example, is the anticipated expansion of rehabilitation programs for stroke victims.

Speech and hearing services in nursing homes and home health agencies are often provided by private practitioners employed on a contract basis. Opportunities for private practitioners are expected to be excellent in the years ahead, and the number of speech pathologists and audiologists in private practice—though small—is likely to rise sharply. This reflects practice patterns as well as reimbursement policies. Evaluation and treatment of communicative disorders usually involve outpatient visits unless other conditions are present. Thus, speech and hearing services can be brought into the home, or to a school, hospital, nursing home, or rehabilitation facility on an as-needed basis. This flexibility in treatment site is an important factor in the anticipated expansion of private practice opportunities.

Job prospects in speech pathology and audiology should be very good through the mid-1990's. New graduates are in demand, and the number of people completing training programs could fall short of that needed to fill job openings. Enrollments in master's degree programs have remained relatively stable since the late 1970's. If program completions remain at current levels and demand for rehabilitation services continues to increase, prospects for jobseekers should become even more favorable than they are today.

Earnings

Audiologists in hospitals and medical centers were paid about $19,800 to $34,900 a year in 1984, compared to about $20,200 to $34,000 for speech pathologists, according to a national survey conducted by the University of Texas Medical Branch.

The annual starting salary in the Federal Government for speech pathologists and audiologists with a master's degree was about $21,800 in early 1985. Those having a doctoral degree were eligible to start at about $26,400.

Related Occupations

Speech pathologists and audiologists specialize in the diagnosis and treatment of speech, language, and hearing problems. Workers in other rehabilitation occupations include occupational therapists, physical therapists, recreational therapists, and rehabilitation counselors.

Sources of Additional Information

State departments of education can supply information on certification requirements for those who wish to work in public schools.

General information on speech pathology and audiology is available from:

American Speech-Language-Hearing Association, 10801 Rockville Pike, Rockville, Md. 20852.

Health Technologists and Technicians

Many jobs in the health field owe their existence to the development of new laboratory procedures, diagnostic techniques, and treatment methods. Quite a few of these involve clinical applications of the computer made possible by the microchip. Clinical laboratories have been transformed by the installation of automated instruments that offer low-cost analyses in minutes. Elsewhere in the hospital, new kinds of equipment—computed tomography (CT) scanners, dialysis machines, and ultrasound scanners, for example—have made possible earlier and more accurate diagnoses and more effective treatment. Technologies that are candidates for widespread use in the years ahead include magnetic resonance imaging, brain wave mapping, laser surgery, and organ transplantion. However, the field of medicine is changing so rapidly that it is impossible to predict what the next generation of devices will bring.

Four statements in this section of the *Handbook* describe health careers that involve operating or monitoring biomedical equipment: Radiologic technologists, electrocardiograph technicians, electroencephalographic technologists and technicians, and clinical laboratory technologists and technicians.

Most *radiologic technologists* operate the familiar X-ray machine, but some specialize. *Computed tomographers*, for example, use equipment linked to a computer for cross-section X-rays of the brain or other parts of the body. *Diagnostic medical sonographers* use equipment which produces an image from sound waves reflected from the body to examine internal organs. *Nuclear medicine technologists* use radioactive substances that show up during imaging, and *radiation therapy technologists* operate the equipment used to treat cancer patients.

Electrocardiograph (EKG) technicians operate equipment that monitors a patient's heart action. Cardiology technology includes far more than the EKG, however, and *cardiology technologists* of various kinds perform or assist with phonocardiograms, echocardiograms, angiograms, stress tests, cardiac catheterizations, and other tests that enable physicians to detect and diagnose heart problems. For example, heart patients scheduled for surgery may be given an echocardiogram (an ultrasound procedure) before cardiac catheterization, often the last step before an operation. Nuclear cardiology and digital subtraction angiography are new cardiac technologies that are likely to gain in importance.

Dialysis technicians, who operate kidney machines, and *perfusionists*, who operate the heart-lung machines used in coronary bypass surgery, are examples of health workers who operate equipment on which patients' lives depend.

Some health occupations are auxiliary jobs redesigned to extend the services of highly skilled health practitioners. *Dental hygienists* expand dental services without sacrificing the quality of care. *Emergency medical technicians* are specially trained to provide medical attention when no physician or nurse is available—typically at the site of a fire, automobile accident, or other emergency.

Practical nursing is by far the largest of the health occupations described in this section of the *Handbook*. Other large occupations are clinical laboratory technologist and radiologic technologist. Most other health technologist occupations are small. In fact, fragmentation into a large number of small and highly specialized occupations is typical of the health field today.

The distinction between a health *technologist* and a health *technician* lies in the complexity of the job. Technologists have more responsibility than technicians, and therefore need more training, which varies with the occupation. For example, *medical technologists*, who use laboratory techniques to test specimens of body fluids and tissues for evidence of disease, need a bachelor's degree in medical technology, chemistry, or biochemistry. *Medical technicians* usually are graduates of 2-year programs.

Preparation for these careers varies. Some workers learn their skills on the job through classroom and laboratory study combined with closely supervised clinical experience. As a rule, the newer the occupation, the more likely that training will be provided on the job. Such is the case, for example, for hospital personnel who operate magnetic resonance scanners. In most health technologist occupations, however, workers are trained formally in hospitals, medical centers, community colleges, 4-year colleges and universities, vocational-technical institutes, or trade schools. Training requirements for specific occupations are described in the statements that follow.

The Committee on Allied Health Education and Accreditation (CAHEA) accredits educational programs for 23 allied health occupations. Information about accredited programs is published annually in the *Allied Health Education Directory*, which may be purchased from:

Department of Allied Health Education and Accreditation, American Medical Association, 535 N. Dearborn St., Chicago, Illinois 60601.

Books and brochures on health careers are available in libraries, counseling centers, and bookstores. The Sources of Additional Information section at the end of each *Handbook* statement identifies organizations that can provide career information, including brochures that describe the work and lists of training programs. For an overview of jobs in the health field, including some not covered in the *Handbook*, request a copy of "200 Ways to Put Your Talent to Work in the Health Field" from:

National Health Council, Inc., 70 West 40th St., New York, N.Y. 10018.

A wide-ranging effort to slow the rate of increase in health care costs is changing the organization and delivery of health care in the United States.

New approaches to paying for care, more stringent review prior to the purchase of expensive equipment, fewer diagnostic tests and procedures per episode of illness, fewer hospital admissions, and far greater use of outpatient and home care are among the trends that will shape the health industry in the years ahead. A slowdown in industry employment growth is a virtual certainty. The various health occupations will fare differently, however, reflecting differences in patterns of illness, sources of payment, the kinds of organizations that provide care, and staffing. Specific factors that are expected to influence demand through the mid-1990's are explained in the Job Outlook sections of the statements that follow.

Clinical Laboratory Technologists and Technicians

(D.O.T. 078.121-010, .161-010, .221-010, .261-010 and -014, .281-010, .361-014 and -030, .381-010 and -014, and .687-010)

Nature of the Work

Laboratory tests play an important part in the detection, diagnosis, and treatment of disease. They are essential in detecting the presence of illnesses in which there are changes in the body fluids and tissues. Examples of such changes include chemical changes in the blood, urine, or other body fluids; increases or decreases in the count of various types of white or red blood cells; microscopic changes in the structure of the cells of a diseased tissue or organ; and the presence of parasites, viruses, or bacteria in the blood or tissue.

Although physicians use the results of laboratory evaluation and diagnosis, they do not perform the tests themselves. Instead, the tests are done by clinical laboratory personnel. These specialists provide laboratory services ranging from routine tests to highly complex analyses, and their level of skill and educational preparation vary accordingly. This section of the *Handbook* discusses the work of two levels of laboratory personnel: Technologists and technicians.

Medical technologists have a bachelor's degree in science, as a rule. They perform complicated chemical, biological, hematological, microscopic, and bacteriological tests. These may include chemical tests to determine, for example, the blood cholesterol level, or microscopic examination of the blood to detect the presence of diseases such as leukemia. Technologists microscopically examine other body fluids; make cultures of body fluid or tissue samples to determine the presence of bacteria, parasites, or other micro-organisms; and analyze the samples for chemical content or reaction. They also type and cross-match blood samples for transfusions.

Technologists in small laboratories perform many types of tests, while those in large laboratories usually specialize. Among the areas in which they can specialize are biochemistry (the chemical analysis of body fluids), blood bank technology (the collection and preparation of blood products for transfusion), cytotechnology (the study of human body cells), hematology (the study of blood cells), histology (the study of human tissue), and microbiology (the study of bacteria and other micro-organisms).

Most medical technologists perform tests related to the examination and treatment of patients. Others do research, develop laboratory techniques, teach, or perform administrative duties.

Medical laboratory technicians generally have an associate degree or a diploma or certificate from a private postsecondary trade or technical school. They are midlevel laboratory workers who function under the supervision of a medical technologist or laboratory supervisor. They perform a wide range of routine tests and laboratory procedures which do not require the analytical knowledge of medical technologists. Like technologists, they may work in several areas or specialize in one field.

Working Conditions

Clinical laboratory personnel generally work a 5-day, 40-hour week. Because hospital laboratories provide service round the clock, workers there may work evenings, nights, weekends, and holidays. Laboratory workers may spend a great deal of time on their feet.

Laboratories generally are well lighted and clean. Although unpleasant odors and infectious materials often are present, few hazards exist if proper methods of sterilization and handling of specimens, materials, and equipment are used. The work can be stressful because patients' lives or types of treatment often depend on the quick and accurate analysis of laboratory tests.

Employment

Clinical laboratory technologists and technicians held about 236,000 jobs in 1984. Most worked in hospitals. Others worked in independent laboratories, physicians' offices, clinics, public health agencies, pharmaceutical firms, and research institutions. Large reference laboratory facilities generally are concentrated in metropolitan areas. Some laboratory workers work part time.

In 1984, Veterans Administration hospitals and laboratories employed about 3,900 medical technologists and about 1,800 medical laboratory technicians. Others worked for the U.S. Public Health Service.

Training, Other Qualifications, and Advancement

The usual requirement for a beginning job as a medical technologist is a bachelor's degree with a major in medical technology or in one of the life sciences, biology or biochemistry, for example. It is also possible to qualify through on-the-job experience, specialized training, or a combination of these.

Bachelor's degree programs in medical technology include substantial

Medical technologists use sophisticated equipment to detect specimen changes.

course work in chemistry, biological sciences, microbiology, and mathematics, with the senior year of course work devoted to acquiring the knowledge and skills used in the clinical laboratory. These programs are offered by colleges and universities as well as by hospitals. The hospital programs generally are affiliated with colleges or universities and lead to a bachelor's degree, although a few hospital programs require a bachelor's degree for entry.

Many universities offer advanced degrees in medical technology and related clinical laboratory sciences for technologists who plan to specialize in a certain area of laboratory work or in teaching, administration, or research.

Medical laboratory technicians acquire their training in a variety of ways, including community and junior colleges, hospitals, and vocational and technical schools. Many programs last 2 years and lead to an associate degree. Some medical laboratory technicians are trained in the Armed Forces.

Persons interested in a clinical laboratory career should be careful about selecting an educational program. Prospective employers—hospitals and independent laboratories—may have preferences as to program accreditation. (Accreditation indicates that an educational program meets established standards.) Educational programs should be able to provide information about the kinds of jobs obtained by graduates, educational costs, the length of time the educational program has been in operation, instructional facilities, and faculty qualifications.

Nationally recognized accrediting agencies in the allied health field include the Committee on Allied Health Education and Accreditation (CAHEA) in cooperation with the National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), and the Accrediting Bureau of Health Education Schools (ABHES). CAHEA accredits programs that provide education for 23 allied health occupations including medical technologists, cytotechnologists, histologic technicians, specialists in blood bank technology, and medical laboratory technicians. ABHES accredits training programs for medical laboratory technicians and medical assistants.

Licensure and certification are well established in the health field as methods of assuring the skill and competence of personnel. Licensure refers to the process by which a government agency authorizes individuals to engage in a given occupation and use a particular job title. Occupational licensing takes place at the State level. Five States—California, Florida, Hawaii, Nevada, and Tennessee—require medical technologists or medical laboratory technicians to be licensed. Other States, such as Georgia, require registration. More information is available from State boards of occupational licensing or from State Occupational Information Coordinating Committees.

Certification is a voluntary process by which a nongovernmental organization such as a professional society grants recognition to an individual who meets prescribed standards. Widely accepted by employers in the health industry, certification is a prerequisite for some jobs, and often is necessary for career advancement. Agencies that certify medical laboratory technologists and technicians include the Board of Registry of the American Society of Clinical Pathologists in conjunction with the American Association of Blood Banks, the American Medical Technologists, the National Certification Agency for Medical Laboratory Personnel, and the Credentialing Commission of the International Society of Clinical Laboratory Technology. These agencies have different requirements for certification and different organizational sponsors.

Accuracy, dependability, and the ability to work under pressure are important personal characteristics for a medical laboratory worker. These workers must be able to pay close attention to detail and be very precise in their work because small differences or changes can be important. Manual dexterity and normal color vision are highly desirable. With the rapid spread of automated laboratory equipment, mechanical and electronic skills are increasingly valued.

Technologists may advance to supervisory positions in certain areas of laboratory work, or, after several years' experience, to chief medical technologist in a large hospital. Manufacturers of laboratory equipment and supplies hire technologists as sales or technical representatives or to work in the research and development of new products. Graduate education in one of the biological sciences, chemistry, management, or education usually speeds advancement. Technicians can advance to technologists by getting additional education and experience.

Job Outlook

Employment of clinical laboratory workers is expected to grow more slowly than the average for all occupations through the mid-1990's. Most openings will result from the need to replace experienced laboratory personnel who transfer to other occupations or stop working altogether.

The pressure to contain health care costs is expected to slow job growth in this field. Hospitals, the leading employer of clinical laboratory personnel, will be more severely affected by the slowdown than other kinds of employers (commercial laboratories, clinics, and offices of physicians) if current trends persist through 1995. Implementation of a new approach to paying hospitals for the services they provide has affected clinical laboratories. Many tests, previously performed routinely as part of either a regular physical examination or the normal admissions procedure, have been dropped. There is a strong push to "target" laboratory tests, doing only those that are essential.

Laboratory tests nevertheless are an integral part of modern medicine and the volume of testing is expected to continue to grow. The increase will be caused by population growth; by the rapid increase in middle-aged and older people and the concomitant increase in disease and disability; and by the development of new diagnostic tests, such as the blood test for the antibody to the virus believed to cause Acquired Immune Deficiency Syndrome (AIDS). An area of laboratory testing that is likely to expand significantly is immunodiagnostics, tests that are able to spot major diseases such as cancer and heart disease in their early, presymptomatic stages.

Also contributing to the relatively slow rate of job growth projected through 1995 is automation. While use of automated equipment in clinical laboratories is already widespread, new equipment is certain to be introduced during the coming decade. Some of this new equipment will mechanize operations that are now done manually, such as a complete automated urine analysis, but much of it will represent more sophisticated versions of existing technologies. New, improved machines will perform more tests from more departments more quickly. The greater speed will allow a faster "turnaround time," so the results can be utilized sooner by physicians, and patients can be released sooner.

Computerization of clinical laboratories is bound to be implemented in ever more wide-ranging and creative ways. The use of computers, especially microcomputers or personal computers, will not only aid in the testing aspect—in quality control, for example—but also in the managerial, administrative, and clerical aspects of laboratory operations. Clinical laboratories will likely be run in a more efficient, cost-saving manner than before.

The use of robots for clinical laboratory testing is in the early stages. Due to the high cost of such equipment, the use of robots will likely be restricted to large commercial laboratories for the foreseeable future. As they are implemented, however, robotic applications will put an additional damper on employment growth.

Due to financial incentives in the new payment system for hospital care, some laboratory testing is likely to shift from hospitals to other settings. These settings include commercial laboratories (sometimes called reference laboratories), physicians' offices, health maintenance organizations, surgicenters, and ambulatory care clinics. Employment of clinical laboratory personnel is expected to rise more rapidly in these settings than in hospitals because their share of the market for laboratory services will grow.

Nonetheless, several forces will operate to restrain growth in nonhospital settings. In addition to the laborsaving effect of automation and computerization, the regulatory environment will play a role. Currently, physicians' offices—and other places, such as clinics, that are directed by physicians—are the least regulated area of laboratory testing. As long as a physican so directs, any employee can perform the tests, whether a nurse, medical assistant, secretary, or medical technologist. Manufacturers of clinical laboratory equipment have been making strenuous efforts to produce machinery specifically tailored to these environments, and have succeeded in making the equipment "user friendly." Hence it is feasible, from a practical as well as a legal standpoint, for nonclinical laboratory personnel in physicians' offices to perform lab work. Assuming no change in the regulatory climate, employment of clinical laboratory workers in physicians' offices almost certainly will grow more slowly than the volume of lab work performed in those offices.

Because the newer laboratory equipment is easier to use and laboratory owners seek to restrain labor costs, employment of technicians is expected to grow faster than that of technologists through the mid-1990's. Technologists will still be needed, however, to analyze the more complex tests and to advise physicians on the use of tests.

Earnings

Salaries of clinical laboratory personnel vary depending on the employer and geographic location. In general, those in large cities receive the highest salaries.

Starting salaries for medical technologists employed by hospitals, medical schools, and medical centers averaged about $18,200 a year in 1984, according to a survey conducted by the University of Texas Medical Branch. Beginning salaries for cytotechnologists averaged about $16,900; for histology technicians, about $14,200; and for medical laboratory technicians, about $13,800. According to the same survey, experienced medical technologists working in hospitals, medical schools, and medical centers averaged about $23,700 a year in 1984; cytotechnologists, about $21,200; medical laboratory technicians, about $18,200; and histology technicians, about $18,000.

Chief medical technologists employed in hospitals earned average annual salaries ranging from $25,300 to $31,000 in 1985, depending on the size of the establishment, according to the Executive Compensation Service, Inc., a subsidiary of The Wyatt Company, Fort Lee, New Jersey.

The Federal Government paid medical technologists a starting salary of about $14,400 a year in 1985. Those having experience, superior academic achievement, or a year of graduate study entered at about $17,800. Starting salaries for technicians began at $12,900 a year in 1985, depending on education and experience. Medical technologists in the Federal Government averaged about $22,800 in 1984, and medical laboratory technicians, about $17,700.

Related Occupations

Clinical laboratory technologists and technicians perform a wide variety of tests to help physicians diagnose and treat disease. Their principal activity is the analysis and identification of substances. Other workers who perform laboratory tests include biology specimen technicians, criminalists, food testers, sample testers, veterinary laboratory technicians, and water purification chemists.

Sources of Additional Information

Career information is available from:

American Society of Clinical Pathologists, Board of Registry, P.O. Box 12270, Chicago, Ill. 60612.

American Society for Medical Technology, 330 Meadowfern Drive, Houston, Tex. 77067.

American Medical Technologists, 710 Higgins Rd., Park Ridge, Ill. 60068.

American Association of Blood Banks, Suite 600, 1117 N. 19th St., Arlington, Va. 22209.

American Association for Clinical Chemistry, 1725 K St. NW., Suite 1010, Washington, D.C. 20006.

American Society of Cytology, Attn: CPRC Secretary, 130 South 9th Street, Suite 810, Philadelphia, Pa. 19107.

Accrediting Bureau of Health Education Schools, Oak Manor Office, 29089 U.S. 20 West, Elkhart, Ind. 46514.

National Certification Agency for Medical Laboratory Personnel, 1725 DeSales St. NW., Suite 403, Washington, D.C. 20036.

International Society for Clinical Laboratory Technology, 818 Olive St., St. Louis, Mo. 63101.

For a list of CAHEA-accredited educational programs for clinical laboratory personnel, write:

Committee on Allied Health Education and Accreditation, 535 N. Dearborn St., Chicago, Ill. 60610.

For a list of training programs for medical laboratory technicians accredited by the Accrediting Bureau of Health Education Schools, write:

Secretary-ABHES, 29089 U.S. 20 West, Elkhart, Ind. 46514.

For information about employment opportunities in a Veterans Administration medical center, contact the personnel office of that center.

Information about employment opportunities with the National Institutes of Health is available from the Clinical Center, National Institutes of Health, Bethesda, Md. 20205.

Dental Hygienists

(D.O.T. 078.361-010)

Nature of the Work

Dental hygienists, working under the direction of a dentist, provide direct patient care; they remove deposits and stains from patients' teeth, expose and develop dental X-ray films, and perform various other preventive and therapeutic services. Helping the public develop and maintain good oral health is another important aspect of the job, and hygienists may instruct patients in the proper selection and use of toothbrushes and other devices, for example, or explain the relationship between diet or smoking and oral health.

Depending on the State law, hygienists may remove deposits from teeth; apply topical fluoride to prevent tooth decay; take medical and dental histories; take X-rays; make impressions of teeth for study models; and prepare other diagnostic aids. In a few States, dental hygienists may perform pain control and restorative procedures.

Dental hygienists in school systems serve in several capacities. Clinical functions include examining children's teeth, assisting the dentist in determining the dental treatment needed, and reporting the findings to parents. They also scale and polish teeth and give oral hygiene instruction. In addition, they develop and deliver classroom and assembly programs on oral health.

A few dental hygienists assist in research projects. Those having advanced training may teach in schools of dental hygiene.

Working Conditions

Dental hygienists usually work in clean, well-lighted offices. Important health safeguards for persons in this occupation are regular medical checkups and strict adherence to established procedures for using X-ray equipment. The occupation is one of several covered by the Consumer-Patient Radiation Health and Safety Act of 1981, which encourages the States to adopt uniform standards for the training and certification of individuals who perform medical and dental radiologic procedures.

Most hygienists work fewer than 35 hours per week. Some of this work may be on Saturdays or during evening hours.

Employment

Dental hygienists held about 76,000 jobs in 1984. Because multiple jobholding is common in this field, the number of jobs greatly exceeds the number of people at work that year. Dentists frequently hire hygienists to work only 2 or 3 days a week, so hygienists who want a full-time schedule must often hold more than one job.

It is not uncommon for dental hygienists to hold several part-time jobs.

Most dental hygienists work in private dental offices. Other places of employment include public health agencies, school systems, business firms, hospitals, clinics, and schools of dental hygiene.

Training, Other Qualifications, and Advancement

Dental hygienists must be licensed. To obtain a license, a candidate must graduate from an accredited dental hygiene school and pass both a written and a clinical examination. For the clinical examination, the applicant is required to perform dental hygiene procedures, such as removing deposits and stains from a patient's teeth. In 1984, candidates in 49 States and the District of Columbia could complete part of the State licensing requirements by passing a written examination given by the National Board of Dental Examiners. Few States permit dental hygienists licensed in other States to practice in their jurisdictions without further examination.

In 1984, 200 schools of dental hygiene in the United States were accredited by the Commission on Dental Accreditation. Most programs grant an associate degree; others lead to a bachelor's degree. A few institutions offer both types of programs. Six schools offer master's degree programs in dental hygiene.

Completion of an associate degree program usually is sufficient for the dental hygienist who wants to practice in a private dental office. To do research, teach, and work in public or school health programs, at least a bachelor's degree usually is required. Dental hygienists with a master's degree work as teachers or administrators in dental hygiene and dental assisting training programs, public health agencies, and in research.

The minimum requirement for admission to a school of dental hygiene is graduation from high school. Several schools that offer the bachelor's degree admit students to the dental hygiene program only after they have completed 2 years of college. Dental hygiene training given in the Armed Forces usually does not fully prepare one to pass the licensing exam, but credit for that training may be granted to those who seek admission to accredited dental hygiene programs.

The curriculum in a dental hygiene program consists of courses in the basic sciences, dental sciences, clinical sciences, and liberal arts. These schools offer laboratory, clinical, and classroom instruction in subjects such as anatomy, physiology, chemistry, pharmacology, nutrition, histology (the study of tissue structure), periodontology (the study of gum diseases), pathology, dental materials, and clinical dental hygiene.

People who want to become dental hygienists should enjoy working with others. The ability to put patients at ease is helpful, for patients often are under stress. Personal neatness, cleanliness, and good health also are important qualities. Dental hygienists must have manual dexterity because they use various dental instruments with little room for error within a patient's mouth. Among high school courses recommended for aspiring dental hygienists are biology, health, chemistry, psychology, speech, and mathematics.

Job Outlook

Employment of dental hygienists is expected to grow faster than the average for all occupations through the mid-1990's. Demand for dental care is expected to rise in the years ahead because of population growth, rising real incomes, growing public awareness of the importance of oral health, and the availability of dental insurance. Many additional job openings for dental hygienists will result from the need to replace workers who leave the occupation.

Job prospects for dental hygienists are affected by practice patterns in dentistry as well as by the level of demand for dental care. At present, the use of dental hygienists is prevalent in some places, but not in others. This is changing as greater numbers of recent dental school graduates set up practice. Young dentists are disposed to hire hygienists because they are taught in dental school how to make effective use of support staff in their dental practices. The trend toward group practice and retail dentistry should also contribute to job growth for hygienists. Groups of dentists generally hire more support staff per dentist than do solo practitioners.

Practice patterns in dentistry are expected to sustain strong demand for dental hygienists. Nonetheless, those patterns could change, in view of the rapidly expanding supply of dentists and improvements in dental health due to fluoridation and other forms of preventive dentistry. There already is evidence of growing competition among dentists for jobs. Should patient load fall sharply, dentists could choose to perform more functions themselves and job growth for dental hygienists would be slower than currently anticipated.

Earnings

Earnings of dental hygienists are affected by the type of employer, education, and experience of the individual hygienist, and the geographic location. Dental hygienists who work in private dental offices are commonly paid by the hour or day, although they may earn a salary or a commission for work performed.

The median hourly earnings of dental hygienists were about $11 in 1984. In 1985, the Federal Government paid dental hygienists with no experience starting salaries of between $12,862 and $14,390 a year depending upon the length of their training. Dental hygienists working for the Federal Government averaged about $17,300 a year in 1984.

Dental hygienists who work for school systems, health agencies, the Federal Government, or State agencies have the same hours, vacation, sick leave, retirement, and health insurance benefits as other workers in these organizations.

Related Occupations

Dental hygienists relieve dentists from many routine tasks. Other occupations performing similar duties for dentists and physicians include dental assistants, dental laboratory technicians, general duty nurses, nurse anesthetists, and radiologic technologists.

Sources of Additional Information

For information on a career in dental hygiene, contact:

Division of Professional Development, American Dental Hygienists' Association, Suite 3400, 444 N. Michigan Ave., Chicago, Ill. 60611.

For information about accredited programs and the educational requirements to enter this occupation, contact:

Commission on Dental Acccreditation, Suite 1814, American Dental Association, 211 E. Chicago Ave., Chicago, Ill. 60611.

The State Board of Dental Examiners in each State, or the American Association of Dental Examiners, 211 E. Chicago Ave., Chicago, Ill. 60611, can supply information on licensing requirements.

Dispensing Opticians

(D.O.T. 299.474-010)

Nature of Work

Half the people in the United States use glasses or contact lenses, and workers in a variety of occupations are involved in providing vision care. Among these are dispensing opticians, who fit eyeglasses and contact lenses.

The health practitioners who examine eyes and prescribe corrective lenses are ophthalmologists and optometrists. (See the statement on physicians, which includes ophthalmologists, and the one on optometrists elsewhere in the *Handbook*.) After a checkup by one of these eye doctors, people who need corrective lenses generally visit a dispensing optician (also called an *ophthalmic dispenser*) to have the prescription for lenses filled. Some optometrists and ophthalmologists do their own dispensing, or employ an optician to do it for them.

Dispensing opticians order the necessary ophthalmic laboratory work, help the customer select appropriate frames, and adjust the finished eyeglasses. In many States, they fit contact lenses.

During the customer's visit, the optician measures the distance between the centers of the pupils of the eyes to determine where lenses should be placed in relation to them. In helping customers select from the various styles and colors of eyeglass frames, they may consider the customer's hairstyle and facial features, occupation and habits, and the weight and thickness of the corrective lenses.

The optician then prepares work orders that give the ophthalmic laboratory the information it needs to grind the lenses and insert them in a frame. The work orders include lens prescriptions and information on lens size, color, and style. Some dispensing opticians do their own lab work, preparing the lenses themselves. After the glasses are made, the optician checks the power and surface quality of the lenses with special instruments, then adjusts the frame to the contours of the customer's face and head so that it fits properly and comfortably. Adjustments are made with handtools, such as optical pliers, files, and screwdrivers.

In fitting contact lenses, dispensing

opticians measure the corneas of customers' eyes, and then prepare specifications for the contact lens manufacturer which include the doctor's prescription and information on size. Fitting contact lenses requires considerably more skill, care, and patience than fitting eyeglasses. Dispensing opticians tell customers how to insert, remove, and care for contact lenses during the initial adjustment period, which may last several weeks. At each visit, to be sure that the fit is correct, the dispensing optician looks at the patient's eyes, corneas, lids, and contact lenses with special instruments and microscopes. Ophthalmologists or optometrists recheck the fit, as needed. Opticians may make minor adjustments; lenses are returned to the prescription laboratory for major changes.

The majority of dispensing opticians fit eyeglasses and contact lenses, but some specialize in fitting cosmetic shells to cover blemished eyes. Still others specialize in fitting artificial eyes (prostheses). In some shops, they may do lens grinding and finishing and sell other optical goods such as binoculars, magnifying glasses, and nonprescription eyeglasses (sunglasses, for instance).

Working Conditions

Dispensing opticians work indoors in pleasant, quiet surroundings that are well lighted and well ventilated. Because they sell and service eye lenses, they deal with customers most of the time. They spend part of their time on their feet. If they work part of the time in a lab where eyeglasses are made, they need to take precautions to guard against the hazards associated with glass dust in the air, as well as in handling various chemical solutions and machines with moving parts. Dispensing opticians generally work a 40-hour week, although a 45- or 50-hour week is not uncommon. Some, especially those employed in retail shops in large shopping centers, work in the evenings and on Saturdays.

Employment

Dispensing opticians held about 42,000 jobs in 1984. Most worked full time.

Most dispensing opticians work for optical shops or for department stores, drug stores, and other retail outlets. About one-third work for ophthalmologists or optometrists who sell glasses directly to patients. A few work in hospitals and eye clinics or teach in schools of ophthalmic dispensing. Some own retail optical shops. Recently, some dispensing opticians have bought franchises from large optical store chains; they become independent owners of the business, but use the chain name.

Employment of dispensing opticians is widely dispersed and tends to follow overall population patterns.

Dispensing opticians help customers choose attractive eyeglass frames.

Training, Other Qualifications, and Advancement

Most dispensing opticians learn their skills on the job. However, employers generally prefer applicants who are familiar with the trade, and an increasing number of trainees have some formal training in optical dispensing and fabricating. On-the-job training in dispensing work may last several years and usually includes instruction in optical mathematics, optical physics, and the use of precision measuring instruments and other machinery and tools. Training programs vary from employer to employer. In large companies, on-the-job training is structured much like an apprenticeship program, while training in small establishments is largely informal.

Employers considering applicants for entry level jobs in optical dispensing look for high school graduates who have had courses in science and mathematics. Knowledge of physics, algebra, geometry, and mechanical drawing is particularly valuable. Previous experience in a related job is an asset. Because dispensing opticians deal directly with the public, they should be tactful and have a pleasant personality. Good communications skills are highly valued.

Formal training in opticianry is offered by community colleges, vocational-technical institutes, trade schools, and manufacturers in programs that last from a few weeks to several years. In 1984, 25 schools offered 2-year programs in optical fabricating and dispensing leading to an associate degree or a certificate or diploma of completion. The Commission on Opticianry Accreditation—consisting of representatives from the American Board of Opticianry, the National Academy of Opticianry, the Opticians Association of America, the National Federation of Opticianry Schools, and the public—accredited 12 of these programs. A number of schools offer shorter programs, usually 6 months to 1 year in length, that lead to a certificate or diploma in opticianry. In addition, some medical schools, contact lens manufacturers, and professional societies offer short, nondegree courses in contact lens fitting. A small number of opticians learn their trade in the Armed Forces.

Some opticians acquire their skills through 2- to 4-year apprenticeship programs offered by optical dispensing companies. Apprentices with exceptional ability may complete their training in a shorter period. Individual States set the entrance requirements for these programs, with high school graduation ordinarily required. Apprentices receive training in optical mathematics and optical physics and in the use of laboratory equipment. In addition to technical training, apprentices may work directly with patients in fitting eyeglasses and contact lenses. Trainees also are taught the basics of office management and sales. In States requiring dispensing opticians to be licensed, information about apprenticeships is available from the State agency responsible for occupational licensing. In the other States, information is available from the Division of Apprenticeship Training of the State Department of Labor.

Credentials for dispensing opticians are gained through licensure—required by law in 22 States and Puerto Rico—and through voluntary certification or registration. In most States that require a license to dispense eyeglasses, continuing education is necessary for relicensure. For specific information about licensing procedures, consult the State board of occupational licensing.

Certification is offered by the American Board of Opticianry and by the National Contact Lens Examiners. Continuing education is required to maintain certification.

Many experienced dispensing opticians go into business for themselves. Others become managers of retail optical stores or sales representatives for wholesalers or manufacturers of eyeglasses or lenses.

Job Outlook

Employment in this occupation is expected to increase faster than the average for all occupations through the mid-1990's in response to the demand for corrective lenses, which is expected to rise as a result of demographic trends. Not only is the population growing, but, over the next decade, the number of middle-aged and elderly persons is projected to rise substantially. Middle age is a time when many persons begin using corrective lenses for the first time, and elderly persons require more vision care, on the whole, than others.

Increasing public awareness of the importance of good eyesight (stimulated by the vision screening programs in schools) is also likely to spur demand. Nowadays, thanks in part to advertising by optical companies, less stigma is attached to wearing eyeglasses than in the past, especially by young people. Industrial safety precautions may require more safety goggles and glasses. Increased participation in various sports may require some people to use special lenses and frames. Fashion, too, is likely to influence demand. The growing variety of frame styles and colors—as well as the increasing popularity of contact lenses—encourages people to buy more than one pair of corrective lenses. Finally, demand is expected to grow in response to products such as photochromic lenses (glasses that become sunglasses in sunlight), tinted contact lenses, bifocal contact lenses, and extended wear contact lenses.

This occupation is vulnerable to changes in the business cycle, with employment falling somewhat during downturns and rising during periods of economic recovery. As is generally the case, however, most openings will arise from the need to replace experienced workers who transfer to other kinds of work or leave the labor force.

Employment opportunities should be excellent for dispensing opticians who have an associate degree in opticianry. Opportunities will be best in metropolitan areas. Not only are there more optical shops and a larger population in cities, but owners of many retail shops in small communities also tend to be the dispensing optician and do not need others.

Earnings

The starting weekly wage rate for newly licensed dispensing opticians in the New York City area—one of the higher paying areas—ranged from $300 to $360 in 1985, based on information from a small number of union contracts. The average experienced dispensing optician in the same area earned at least $400 a week.

Dispensing opticians who own and operate their own shops can expect to earn considerably more, generally from $30,000 and more a year.

Apprentices start at a wage of about 60 percent of the skilled worker's rate and receive periodic increases so that, upon completion of the apprenticeship program, they are earning the beginning rate for experienced workers.

Some dispensing opticians are members of unions. The principal union in this field is the International Union of Electronic, Electrical, Technical, Salaried and Machine Workers (AFL-CIO).

Related Occupations

Other occupations in which workers use machines and tools for precise, delicate work include biomedical equipment technician, calibrator, dental laboratory technician, glass blower, instrument repairer, locksmith, ophthalmic laboratory technician, orthodontic technician, prosthetics technician, and watch repairer.

Sources of Additional Information

For general information about this occupation, contact:

National Federation of Opticianry Schools, New York City Technical College, Ophthalmic Dispensing Department, 300 Jay St., Brooklyn, N.Y. 11201.

Opticians Association of America, 10341 Democracy Lane, P.O. Box 10110, Fairfax, Va. 22030.

National Academy of Opticianry, 10111 George Palmer Highway, Suite 112, Bowie, Md. 20716.

Chairperson of Optical Council, IUE-AFL-CIO, 200 Park Ave. South, Suite 1701, New York, N.Y. 10003.

A list of schools of opticianry is available from either of the following organizations:

Commission on Opticianry Accreditation, 10111 George Palmer Hwy., Suite 110, Bowie, Md. 20716.

National Federation of Opticianry Schools, New York City Technical College, Ophthalmic Dispensing Department, 300 Jay St., Brooklyn, N.Y. 11201.

Electrocardiograph Technicians

(D.O.T. 078.362-018)

Nature of the Work

Electrocardiograms (EKG's) are graphic tracings of heartbeats recorded by an instrument called an electrocardiograph. These tracings indicate the electrical changes that occur during and between heartbeats. EKG technicians operate the electrocardiograph to produce the tracings for review by a physician.

Physicians order electrocardiograms to help diagnose certain forms of heart disease and to analyze changes in the condition of a patient's heart over a period of time. The test is done before most kinds of surgery, including outpatient surgical procedures. Some physicians use electrocardiograms as a routine diagnostic procedure for persons who have reached a certain age. In many fields, electrocardiograms are required as part of preemployment physical examinations.

Since the equipment is mobile, EKG technicians can record electrocardiograms in a doctor's office, in a hospital heart station (cardiology department), or at the patient's bedside. After explaining the procedure to the patient, the technician attaches 10 electrodes—also called "leads"—to the chest, arms, and legs of the patient. Normally the technician applies a gel between the electrodes and the patient's skin to facilitate the passage of the electrical impulses. By manipulating switches on the electrocardiograph and positioning the electrodes across the chest, the technician obtains a recording of the heart's electrical action. A stylus records the tracings on graph paper. The test may be given while the patient is resting or while exercising. The technician must know the anatomy of the chest and heart to select the exact locations for the chest electrodes. Electrodes placed in the wrong location result in an inaccurate reading.

After the recording is completed, the technician prepares the electrocardiogram for analysis by a physician, usually a heart specialist. Newer EKG equipment employs a computer to analyze the tracing, and the technician may need to enter information into the console using a keyboard. Technicians must be able to recognize and correct any technical errors, such as crossed leads, incorrect lead placement, or electrical interference, that prevent an accurate reading. They also must call the doctor's attention to any significant deviations from the average normally recorded by the technique used. Physicians then review the recordings and study these and other deviations identified.

Cardiology is one of the most rapidly developing fields in medicine today, and increasingly sophisticated procedures for diagnosing and treating heart and circulatory problems are being introduced all the time. These have raised skill requirements and created new occupations in the areas of cardiovascular and cardiopulmonary technology. EKG technicians perform a relatively simple task and do not have the skills to assist in the newer cardiac procedures unless they complete additional training.

For example, recognition of the value of monitoring heart action while the patient is normally active has led to widespread use of 24-hour ambulatory monitoring (also called Holter monitoring, after the physician who developed the equipment) and exercise stress testing—a test that records the EKG during physical activity. Technicians who perform these tests need highly specialized EKG training.

Some EKG technicians schedule appointments, type doctors' diagnoses, maintain patients' EKG files, care for equipment, and assist in more specialized cardiac testing.

Careful placement of the electrodes by the EKG technician insures an accurate reading.

Working Conditions

Technicians generally work a 5-day, 40-hour week, which may include Saturdays and Sundays. Those in hospitals and private clinics also may work evening hours. A lot of time is spent standing. The work can become hectic.

Employment

Electrocardiograph technicians held about 21,000 jobs in 1984. Most worked in cardiology departments of large hospitals. Others worked part time in small general hospitals where workloads are usually not great enough to demand full-time technicians. Some worked full or part time in clinics and cardiologists' offices.

Training, Other Qualifications, and Advancement

EKG technicians are trained on the job, as a rule. Training usually is conducted by an EKG supervisor or a cardiologist and lasts no more than 4 to 6 weeks for the basic "resting" EKG. Training for specialized EKG testing is much more extensive—usually 12 to 24 months—and involves in-depth study of cardiovascular anatomy and physiology.

Applicants for trainee positions generally must be high school graduates. High school courses recommended for students interested in this field include health, biology, and typing. Familiarity with medical terminology can be acquired in classes on human anatomy and physiology and by studying a medical dictionary. Applicants for EKG training must be reliable, have mechanical aptitude, ability to follow detailed instructions, and presence of mind in emergencies. A pleasant, relaxed manner for putting patients at their ease is an asset.

There are no licensing requirements for EKG technicians; acquiring credentials—available through the American Cardiology Technologists Association and the National Alliance for Cardiovascular Technologists—is voluntary.

With suitable experience and additional training, EKG technicians may advance to monitor technician, Holter monitor technician, stress testing technician, echocardiography technician, and cardiac catheterization technician. Promotion to supervisory positions is possible, too.

Job Outlook

Employment of EKG technicians is expected to grow as fast as the average for all occupations through the mid-1990's, primarily as the result of major strides in the prevention, diagnosis, and treatment of heart disease, together with continued acceptance of the EKG as a baseline test.

Because middle-aged and elderly people are much more likely than young people to have heart or blood vessel disease, the very rapid increase in these population groups will heighten demand for cardiac care in the years ahead and will spur demand for EKG technicians. Further, the EKG is widely used in prevention efforts—both in mass health screenings and routine physical examinations.

Employment of EKG technicians would grow even faster were it not for the advanced skills required for the newer cardiac procedures, coupled with hospitals' efforts to cut labor costs. There is little doubt that EKG's will continue to be widely used. But the equipment used for a resting EKG is so simple that the necessary skills can be mastered fairly quickly. This has already led some hospitals to "cross train" registered nurses, respiratory therapists, and other hospital personnel in EKG procedures, thereby reducing requirements for EKG technicians. Should cross-training become a dominant trend in hospital staffing, there would be even fewer new jobs for EKG technicians than currently expected.

An increasing number of jobs will be in offices of cardiologists, cardiac catheterization laboratories, cardiology clinics, health maintenance organizations, and other outpatient settings. Facilities such as these are expected to experience very rapid growth through the mid-1990's. Nonetheless, hospitals are likely to remain the dominant employer of EKG technicians.

Because entry requirements are minimal, the pool of prospective jobseekers is very large. In some communities, individuals seeking positions as EKG technicians may find that employers prefer applicants with previous EKG experience or formal training, including Armed Forces training.

Earnings

EKG technicians employed in hospitals, medical schools, and medical centers earned starting salaries of about $12,000 a year in 1984, according to a survey by the University of Texas Medical Branch. EKG technicians who perform more sophisticated tests are paid more than those who perform only basic ones. Some experienced EKG technicians earned as much as $25,000 a year.

EKG technicians employed by the Federal Government are called Medical Machine Technicians. Depending on their education and experience in this occupation, newly hired workers could earn annual salaries ranging from $12,862 to $19,740 in 1985.

EKG technicians in hospitals receive the same fringe benefits as other hospital personnel, including health insurance, pension benefits, vacations, and sick leave. Some institutions provide tuition assistance, uniforms, and other benefits.

Related Occupations

Other occupations requiring operation of diagnostic or therapeutic equipment include audiometrists, electroencephalographic (EEG) technologists and technicians, radiologic technologists, clinical laboratory technologists and technicians, cardiovascular technologists, cardiopulmonary technologists, and electroneurodiagnostic technicians.

Sources of Additional Information

Local hospitals can supply information about employment opportunities.

For a list of training programs in cardiovascular technology, contact:

American Cardiology Technologists Association, Inc., 1980 Isaac Newton Square, South Reston, Va. 22090.

National Alliance of Cardiovascular Technologists, 1100 Raleigh Building, P.O. Box 2598, Raleigh, N.C. 27602.

For information about acquiring credentials in cardiovascular technology, contact:

National Board of Cardiovascular Testing, Inc., 1980 Isaac Newton Square, South Reston, Va. 22090.

National Alliance of Cardiovascular Technologists, 1100 Raleigh Building, P.O. Box 2598, Raleigh, N.C. 27602.

For a list of training programs in cardiopulmonary technology, contact:

National Society for Cardiopulmonary Technology, Inc., Suite 307, 1 Bank St., Gaithersburg, Md. 20878.

For information about acquiring credentials in cardiopulmonary technology, contact:

National Board for Cardiopulmonary Certification, 2801 Far Hills, #309, Dayton, Ohio 45419.

Electroencephalographic Technologists and Technicians

(D.O.T. 078.362-022)

Nature of the Work

Electroencephalography is a procedure that measures the electrical activity of the brain. A machine called an electroencephalograph records this activity and produces a written tracing of the brain's electrical impulses. This record of brain waves, an electroencephalogram (EEG), can be taken while patients are at rest, while they are subjected to stimuli such as loud sounds and blinking lights, or during periods of exaggerated breathing.

Neurologists use electroencephalograms to help diagnose the extent of injury for patients suspected of having brain tumors, strokes, or epilepsy; to measure the effects of infectious diseases on the brain; and to determine whether individuals with mental or behavioral problems have any organic impairment. EEG's are conducted on confused or disoriented patients suspected of having Alzheimer's disease, for example. Surgeons use them to monitor the patient's condition during open heart surgery. EEG's are standard in intensive care units as well, since absence of electrical activity in the brain is a basis for determining that a patient is "clinically" dead.

The people who operate electroencephalographs are called EEG technologists or technicians. The titles are used interchangeably and do not necessarily denote different skill levels, although EEG technologists usually have a broader knowledge of the work than technicians.

Before EEG personnel produce electroencephalograms, they take a short medical history and help the patient relax. Then they apply electrodes to designated spots on the patient's head and make sure that the machine is working correctly. The technologist or technician chooses the most appropriate combination of instrument controls and electrodes to produce the kind of record needed. EEG personnel must recognize and correct any artifacts that appear (an artifact is an electrical or mechanical event that comes from somewhere other than the brain, such as eye movement or interference from electrical sources). Mechanical problems with the electroencephalograph are reported to the supervisor, so that the machine can be repaired promptly. EEG personnel must know how to recognize changes in the patient's neurologic, cardiac, and respiratory status. To react properly in an emergency, they must understand the kinds of medical emergencies that can occur while they are taking the electroencephalogram. For example, if a patient suffers an epileptic seizure, the technician or technologist must take the proper action.

Sometimes EEG technologists operate EEG equipment and other electrophysiologic monitoring devices hooked up to tape recorders, computers, or video equipment. Specialized equipment permits an EEG to be taken while the patient is moving about (ambulatory monitoring) or while the patient's movements are being recorded on camera (split-screen video).

Sophisticated electroneurodiagnostic techniques include "evoked potential" and brain wave mapping. In evoked potential, a patient's brain is stimulated with a series of auditory clicks, blinking lights, or electrical impulses. A computer collects and averages the results for the doctor to study. Brain wave mapping uses a computer to translate brain waves into color-coded maps of variations in the electrical firing of the brain's nerve cells. It can be used in conjunction with the evoked potential technique. EEG personnel using these techniques have special training.

An EEG records the electrical activity of the brain.

Besides supervising technicians during recordings, some EEG technologists may arrange work schedules and teach EEG techniques. Technologists may also have administrative responsibilities, such as managing the laboratory, keeping records, scheduling appointments, ordering supplies, and establishing correct treatment procedures.

In some hospitals, job duties are not confined to electroencephalography. EEG technologists and technicians perform other kinds of procedures as well. To acquire the requisite skills, health technologists are "cross-trained" to handle several different machines. A new trend in hospital staffing, the cross-training of "multi-competent" technicians, is seen as a way of holding down labor costs.

Working Conditions

EEG technologists and technicians usually work in clean, well-lighted surroundings, and spend about half of their time on their feet. A lot of bending is necessary as they may work with patients who are unruly or very ill and require assistance. EEG's can be taken while the patient is seated or lying down.

A 5-day, 40-hour workweek with little overtime is normal, although some hospitals require EEG technologists and technicians to be "on call" (ready to report to work at a moment's notice) after hours and on weekends and holidays. These employees generally work during the day, but those involved in sleep studies work evenings and nights.

Employment

Electroencephalographic technologists and technicians held about 5,900 jobs in 1984. Most EEG jobs are in hospitals, but other health care settings are gaining in importance. EEG technologists and technicians work in neurology laboratories; offices of neurologists and neurosurgeons; group medical practices; health maintenance organizations; urgent care centers and clinics; and psychiatric facilities. Most EEG personnel work full time.

Training, Other Qualifications, and Advancement

EEG technologists and technicians generally learn their skills on the job, although some complete formal training programs. Applicants for trainee positions in hospitals need a high school diploma, as a rule. Often, EEG trainees transfer to the neurology department from other jobs in the hospital, such as laboratory aide or licensed practical nurse.

Formal training for EEG technologists is offered at the postsecondary level by hospitals, medical centers, community colleges, vocational-technical institutes, and colleges and universities. In 1984, the Committee on Allied Health Education and Accreditation (CAHEA) had approved 20 formal training programs for EEG personnel. Programs usually last from 1 to 2 years and include laboratory experience as well as classroom instruction in neurology, anatomy, neuroanatomy, physiology, neurophysiology, clinical and internal medicine, psychiatry, and electronics and instrumentation. Graduates receive associate degrees or certificates.

Credentials for EEG personnel are available through the American Board of Registration of Electroencephalographic Technologists (ABRET), which awards the title "Registered EEG Technologist" (R. EEG T.) to qualified applicants. Although not generally required for entry level jobs, registration indicates professional competence, and may be necessary for supervisory or teaching jobs.

Persons who want to enter this field should have manual dexterity, good vision, an aptitude for working with electronic equipment, and the ability to work with patients as well as with other health professionals. High school students considering a career in this occupation should take courses in health, biology, human anatomy, and mathematics.

EEG personnel in large hospitals can advance to chief EEG technologist and take on increased responsibilities in laboratory management and in teaching basic techniques to new personnel or students from EEG training programs. Chief EEG technologists generally are supervised by a physician—an electroencephalographer, neurologist, or neurosurgeon.

Job Outlook

Employment of EEG technologists and technicians is expected to grow faster than the average for all occupations through the mid-1990's, despite mounting concern about health care costs and a marked slowdown in hospital industry growth. While some EEG positions may be lost to nurses and multicompetent technicians, demand for EEG personnel in hospitals is likely to be sustained by a number of factors: Public support for high quality care; continued growth of intensive care units, which affect demand because electroencephalography is so important in establishing brain death; widespread use of EEG's as a monitoring device during surgery; and the medical community's acceptance of the EEG as a general diagnostic tool.

Advances in clinical neurophysiology are likely to spur demand as well. Such advances include "evoked potential" testing, increasingly used by office-based neurologists to aid in the diagnosis of a variety of conditions, including multiple sclerosis. Brain wave mapping could heighten demand for these workers if the procedure is widely adopted. Still performed experimentally, for the most part, brain wave mapping is expensive but extraordinarily powerful. Like magnetic resonance imaging and CT scanning, it enables physicians to look at what is going on inside a patient's skull without resorting to surgery.

Because job growth through the mid-1990's is expected to be very rapid in outpatient settings, including offices of neurologists, group medical practices, and health maintenance organizations, opportunities are likely to be especially favorable in those settings. As in other occupations, however, most job openings will result from the need to replace workers who transfer to other jobs or stop working.

Earnings

Starting salaries of EEG technicians employed by hospitals, medical schools, and medical centers averaged $13,269 a year in 1984, according to a survey by the University of Texas Medical Branch. Starting salaries for registered EEG technologists were $1,000 to $2,000 higher. Top salaries of experienced EEG technicians ranged as high as $19,500 a year. Highly qualified technologists may earn more as teachers for special training, supervisors of EEG laboratories, or program directors of schools of EEG technology.

EEG technologists and technicians employed by the Federal Government are called Medical Machine Technicians. Depending on education and experience, beginning annual salaries ranged from about $12,862 to $19,740 in 1985.

EEG technologists and technicians in hospitals receive the same benefits as other hospital personnel, including hospitalization, vacation, and sick leave benefits. Some institutions provide tuition assistance or free courses, pension programs, uniforms, and parking.

Related Occupations

Related occupations in supervised medical activities are audiometrists, dental assistants, electrocardiograph technicians, electroneurodiagnostic technicians, licensed practical nurses, nursing aides, occupational therapy assistants, surgical technicians, physical therapy aides, and psychiatric aides.

Sources of Additional Information

Local hospitals can supply information about employment opportunities.

For general information about a career in electroencephalography as well as a list of accredited training programs, contact:

Executive Office, American Society of EEG Technologists, Sixth at Quint, Carroll, Iowa 51401.

Information on becoming a registered EEG technologist is available from:

The Psychological Corporation, ABRET Exam, 7500 Old Oak Blvd., Cleveland, Ohio 44130.

Emergency Medical Technicians

(D.O.T. 079.374-010)

Nature of the Work

An automobile accident, a heart attack, a near drowning, an unscheduled childbirth, a poisoning, a gunshot wound—all of these situations demand urgent medical attention. Seeing medical emergencies like these handled on television has made millions of Americans aware of the crucial role played by emergency medical technicians (EMT's), formerly called ambulance attendants.

A call from a dispatcher sends EMT's—who work in teams of two—to the scene of the emergency. Although speed is essential, EMT's obey the traffic laws for the operation of emergency vehicles. They also must know the best route to take in the face of traffic, road construction, and weather conditions.

Upon arriving at the scene, the driver parks the ambulance in a safe place to avoid accidents. If no police are present, bystanders may be enlisted to lend a hand. For instance, in the case of an automobile accident, bystanders can help control traffic by placing road flares, removing debris, and redirecting traffic.

EMT's first determine the nature and extent of the victims' illnesses or injuries and establish priorities for emergency medical care. They look for medical identification emblems that denote if the victim has epilepsy, diabetes, or other medical conditions, so they can provide the correct treatment. EMT's give appropriate emergency care, including opening and maintaining an airway, restoring breathing, controlling bleeding, treating for shock, immobilizing fractures, bandaging, assisting in childbirth, managing mentally disturbed patients, treating and resuscitating heart attack victims, and giving initial care to poison and burn victims.

When persons are trapped, such as in an automobile accident, EMT's face a double problem. First, they must assess the victims' injuries and supply all possible emergency medical care and protection to the trapped persons. Then they must use the correct equipment and techniques to remove the victims safely. EMT's may request additional help or special rescue or utility services by radio or telephone from a dispatcher.

In case of death, EMT's notify the proper authorities and arrange for the protection of the deceased's property.

When patients must be transported to a hospital, EMT's place the patients on stretchers, lift them into the ambulance, and secure both the patients and the stretchers for the ride. EMT's then drive to the hospital their instructions call for, or, if none has been stipulated in advance, they choose the nearest hospital appropriately equipped to treat their patients. To assure prompt treatment upon arrival, EMT's report by radio directly to the hospital emergency department about the nature and extent of injuries or illness and the number of persons being transported, or they may relay this information and their destination to the emergency dispatcher. They may ask for additional instructions from the hospital's emergency medical staff.

On the way to the emergency department, EMT's monitor patients' vital signs and give additional care as needed or as directed by a physician with whom they have radio contact.

Some EMT's work in large hospital shock trauma units which use helicopters to transport critically ill or injured patients. Upon receiving a call for help, the helicopter transports the EMT's to a point as close to the accident as possible. Once at the site of the accident, they perform all the standard emergency duties: Treating and loading patients and monitoring them during the trip to the hospital. Because operating costs are so high, helicopters are usually reserved for patients who require the immediate or specialized attention available only at a shock trauma unit.

Upon arrival at the hospital, EMT's help transfer patients from the ambulance to the emergency department. They report their observations and care of the patients to the emergency department staff for diagnostic purposes and as a matter of record. EMT's may help the emergency department staff.

One of the duties of EMT's is to maintain a clean, well-equipped ambulance. After each run, EMT's replace the used linen, blankets, and other supplies, send reuseable items to be sterilized, and carefully check all equipment so that the ambulance is ready for the next trip. If they have carried patients who have a contagious infection, they decontaminate the interior of the ambulance and report such calls to the proper authorities. In cases of radiation contamination, they seek special experts to remove the radiation. EMT's make sure that the ambulance is in good operating condition by checking the gasoline, oil, tire pressure, lights, siren, heater, brakes, and communications equipment before their shift begins.

In addition to the basic EMT, whose work has been described, there are two other types of EMT's: EMT-Intermediates and EMT-Paramedics. EMT-Intermediates possess a wider range of medical skills than the basic EMT and are certified to assess trauma patients, administer intravenous therapy, and use antishock garments and esophageal airways.

Quick work by EMT's helps save lives.

The EMT-Paramedic is trained in the most advanced life support skills. Working with radio communication under the direction of a physician, EMT-Paramedics may, depending on State law, administer drugs, both orally and intravenously, use more complex equipment such as a defibrillator, and perform the most advanced prehospital procedures allowed by law.

Working Conditions

Because EMT's must treat patients indoors and out, they are exposed to all kinds of weather. Much of their time is spent standing, kneeling, bending, and lifting. At times the work is very strenuous and stressful.

EMT's employed by fire departments often have a 56-hour workweek. Those employed by hospitals, private firms, and police departments usually work 40 hours a week. Some EMT's, especially those in police and fire departments, have to be on call for extended periods. Volunteer EMT's have varied work schedules, but many put in from 8 to 12 hours a week. Because many ambulance services function 24 hours a day, EMT's often work nights and weekends. Irregular working hours add to the stress of the job.

Employment

In 1984, there were an estimated 47,000 paid EMT's, a small number of whom were EMT-Paramedics. Another 86,000 EMT's worked as volunteers on rescue squads—mostly associated with fire departments. Most paid EMT's work full time, while most volunteers work part time.

Paid EMT's are distributed about equally among private ambulance services, hospitals, and municipal police and fire departments.

Not surprisingly, volunteers are generally basic EMT's. Those with more education and training, such as EMT-Intermediates, are more likely to hold a paid position. At the highest level, EMT-Paramedic, relatively few are volunteers.

Training, Other Qualifications, and Advancement

Few EMT's received formal training until recent years. Now instruction in emergency medical care techniques is mandatory. A national standard training course is the 110-hour program designed by the U.S. Department of Transportation. This program, or its equivalent, is available in all 50 States and the District of Columbia. It is offered by police, fire, and health departments; in hospitals; and as a nondegree course in medical schools, colleges, and universities.

This course provides instruction and practice in dealing with emergencies such as bleeding, fractures, airway obstruction, cardiac arrest, and emergency childbirth. Students learn to use and care for common emergency equipment, such as backboards, suction machines, splints, oxygen delivery systems, and stretchers. Physicians, nurses, and experienced EMT's usually give the lectures and demonstrations.

After completing the basic EMT program, students may take a 2-day course dealing with the removal of trapped victims, as well as a 5-day course on driving emergency vehicles.

EMT-Intermediates must have basic EMT training plus some of the EMT-Paramedic courses. The additional training includes instruction in patient assessment as well as the use of esophageal airways, intravenous fluids, and antishock garments.

Training programs for EMT-Paramedics, of which there were about 440 in 1985, generally last from 3 to 5 months. The American Medical Association's Committee on Allied Health Education and Accreditation accredits these programs. In many places, refresher courses and continuing education are available to EMT's.

Although requirements vary, applicants to an EMT training course generally must be at least 18 years old, have a high school diploma or the equivalent, and have a valid driver's license. Among high school subjects recommended for persons interested in the field are driver education and health and science courses. Training in the Armed Forces as a "medic" is good preparation for prospective EMT's.

Graduates of approved EMT training programs who meet certain experience requirements and pass a written and practical examination administered by the National Registry of Emergency Medical Technicians earn the title of Registered EMT-Ambulance. To maintain their proficiency, EMT's must register again every 2 years. To reregister, an individual must be working as an EMT, meet a continuing education requirement, and pay a fee.

Registration for EMT-Paramedics requires current registration or State certification as an EMT-Ambulance, successful completion of an EMT-Paramedic training program, 6 months of field experience as an EMT-Paramedic, and passing a written and practical examination. Reregistration is required every 2 years.

The level of registration for EMT-Intermediate is above that for basic EMT's, but below that for EMT-Paramedics. The examination covers the first part of the EMT-Paramedic training curriculum and builds upon the basic EMT skill levels. Current registration or certification at the basic EMT level is a prerequisite.

Although not a general requirement for employment, registration is acknowledgment of an EMT's qualifications and makes higher paying jobs easier to obtain. In 1985, about 59,000 basic EMT's were registered.

In addition, all 50 States have some kind of certification procedure. In 24 States, registration with the National Registry is required at some or all levels of certification. Fifteen other States offer the choice of their own certification examination or the National Registry examination.

EMT's should have good dexterity and physical coordination. They must be able to lift and carry up to 100 pounds. EMT's need good eyesight (corrective lenses may be used) with accurate color vision.

Because EMT's often work under trying conditions, they must exercise good judgment under stress and have leadership ability. Emotional stability and the ability to adapt to many different situations help them handle difficulties. They should have a neat and clean appearance and a pleasant personality.

Job Outlook

Employment of EMT's is expected to grow more slowly than the average for all occupations through the mid-1990's. Conflicting forces will shape the job outlook. On the one hand, population growth and especially an increase in the number of older people are expected to spur demand for EMT's. The very rapid increase in the population age 75 and above, for example, will lead to greater use of ambulance services. Developments in the field of emergency medicine are likely to heighten demand as well. As more physicians and nurses specialize in emergency medicine, appropriately trained EMT's are likely to be used more effectively. Upgrading of the profession is expected to stimulate job growth for paid EMT's.

Other factors are likely to constrain job growth, however. Of foremost importance is the rising cost of training and equipping EMT's. Cost containment will doubtless remain a preoccupation of emergency medical service providers for some time to come. The clinical value of EMT services will accordingly be weighed against the cost to a greater extent than was true in the past. Other factors that may adversely affect demand for EMT's include the termination of Federal startup funds for community EMT services, taxpayer resistance to increased local government expenditures, and the availability of unpaid volunteers.

Opportunities for paid EMT's are expected to be best in municipal governments and hospitals. In many localities, taxpayers have come to regard emergency medical services as a basic municipal service—as essential as police and fire protection, for example. Competition for municipal jobs will remain keen, however, reflecting the abundance of applicants who vie for these jobs.

Those hospitals that expect emergency medical services to be potentially profitable are likely to expand their programs, putting them in direct competition with private ambulance services in some cases. Few of the new jobs for EMT's will be found in private ambulance companies, reflecting the difficulty many companies are expected to encounter in covering training and operating costs. Some companies will go out of business.

In addition to job openings created by increased demand from municipal and hospital employers, many openings will occur due to replacement needs resulting from the relatively high level of turnover in this occupation.

Earnings

Earnings of EMT's depend on the employment setting and geographic location as well as the individual's training and experience. According to a 1984 survey by the *Journal of Emergency Medical Services (JEMS)*, annual average earnings for an EMT-Ambulance (basic) were $14,520; for an EMT-Intermediate, $14,716; and for an EMT-Paramedic, $18,540.

EMT's working for police and fire departments usually are paid the same salaries as police officers and firefighters. (See statements on police officers and firefighters elsewhere in the *Handbook*.)

The employee benefits offered by private companies, such as vacation, sick leave, and health insurance, vary widely. EMT's employed by hospitals and police and fire departments receive the same benefits as the other employees.

Related Occupations

Other workers in occupations that require quick and level-headed reactions to life-or-death situations are police officers, firefighters, and registered nurses.

Sources of Additional Information

Information concerning training courses, registration, and job opportunities for prospective EMT's can be obtained by writing to the Emergency Medical Service Director of your State.

Information about the registration of EMT's also is available from:

National Registry of Emergency Medical Technicians, P.O. Box 29233, Columbus, Ohio 43229.

General information about EMT's is available from:

National Association of Emergency Medical Technicians, P.O. Box 334, Newton Highlands, Mass. 02161-0334.

Licensed Practical Nurses

(D.O.T. 079.374-014)

Nature of the Work

Licensed practical nurses (LPN's) help care for the physically or mentally ill and infirm. Under the direction of physicians and registered nurses, they provide nursing care that requires technical knowledge but not the professional education and training of a registered nurse. (The work of registered nurses is described elsewhere in the *Handbook*.) In California and Texas, licensed practical nurses are called *licensed vocational nurses*.

In hospitals, LPN's provide bedside care. They take and record temperatures and blood pressures, change dressings, administer certain prescribed medicines, and help patients with bathing and other personal hygiene. They assist physicians and registered nurses in examining patients and in carrying out nursing procedures. They also assist in the delivery, care, and feeding of infants, as well as in the rehabilitation of patients. Some licensed practical nurses work in specialized units such as intensive care or recovery rooms. There they perform special nursing procedures and operate sophisticated equipment to provide care for seriously ill or injured patients. In some instances, experienced LPN's supervise hospital attendants and nursing aides.

LPN's who work in private homes provide day-to-day patient care that may involve nursing treatments and use of technical equipment. In addition to providing nursing care, they may prepare meals, see that patients are comfortable, and help keep up their morale. They may teach family members how to perform simple nursing tasks.

In doctors' offices and in clinics, LPN's prepare patients for examination and treatment, administer medications, apply dressings, assist the physician in selected procedures, do some laboratory work, and teach patients prescribed health care regimens. They also may make appointments and record information about patients.

Working Conditions

Licensed practical nurses in hospitals generally work 40 hours a week, but often this includes some work at night and on weekends and holidays. They often must stand for long periods and help patients move in bed, stand, or walk. They must be able to handle the emotional stress involved in working with sick patients and their families.

In private homes, LPN's usually work 8 to 12 hours a day and go home at night. Private duty nursing affords a great deal of freedom in setting work hours and the length and frequency of work assignments.

Employment

Licensed practical nurses held about 602,000 jobs in 1984. Over half the wage and salary jobs were in hospitals, as the accompanying chart shows. A substantial number were in nursing homes, and the rest were in schools, clinics, and doctors' offices, for the most part.

Some LPN jobs are held by private duty nurses. These LPN's are either self-employed, in which case they are hired directly by patients or their families, or they are employees of a nurses' registry or temporary help agency. About a quarter of all LPN's work part time.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require practical nurses to have a license. To become licensed, applicants must complete a State-approved program in practical nursing and pass the national written examination. Educational requirements for enrollment in State-approved training programs range from completion of ninth grade to high school graduation, but a high school diploma is usually preferred.

In 1984, about 1,279 State-approved programs provided practical nursing training. Trade, technical, or vocational schools offered more than half of these programs. Other programs were available at community and junior colleges, hospitals, and health agencies. Several programs operated by the Armed Forces for military personnel were State-approved for practical nurse training. Graduates of these programs can apply for licensure.

Practical nurse training programs generally last 1 year and include both classroom study and clinical practice. Classroom instruction covers nursing concepts and principles and related subjects including anatomy, physiology, medical-surgical nursing, pediatrics, obstetrics, psychiatric nursing, administration of drugs, nutrition, first aid, and community health. In addition, students receive supervised clinical experience—usually in a hospital.

LPN's should have a deep regard for human welfare and be emotionally stable because work with the sick and injured can be upsetting. As part of a health care team, they must be able to follow orders and work under close supervision.

Advancement opportunities are limited, although in-service educational programs prepare some LPN's for work in specialized areas, such as postsurgery recovery rooms or intensive care units.

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Increasingly, however, practical nurse training programs are designed to allow practical nurse graduates to continue their education and eventually satisfy the formal requirements for registered nurse. For example, in over 80 associate degree RN programs, the first year of study satisfies the educational requirements for LPN. After this first year of study, students can apply for licensure as a practical nurse and begin working, or they can complete both years of coursework and seek licensure as a registered nurse.

Job Outlook

Employment of LPN's is expected to rise about as fast as the average for all occupations through the mid-1990's, largely in response to the long-term care needs of a growing and aging population.

The emphasis of American medicine on acute care and high technology has already had the effect, over the past decade, of restraining employment growth in practical nursing. This trend is expected to continue. It will shift more and more LPN jobs to nursing and personal care homes, psychiatric hospitals, private duty nursing, and other settings where care and treatment is less technologically oriented.

Widespread use of sophisticated medical technologies has produced a demand for highly skilled support staff. In academic medical centers, teaching hospitals, and other institutions where the most advanced technology is in place, registered nurses, physician assistants, and health technologists are sought for the additional training these positions generally require; LPN's are being phased out.

Efforts to restrain the increase in health care costs are likely to limit job growth for LPN's. The trend toward less costly outpatient care is expected to affect staffing patterns in hospitals, for example, dampening demand for both LPN's and nursing aides. In addition, opportunities for LPN's in the rapidly growing outpatient care sector may be fairly limited, since health maintenance organizations, clinics, and urgent care centers generally prefer to hire registered nurses.

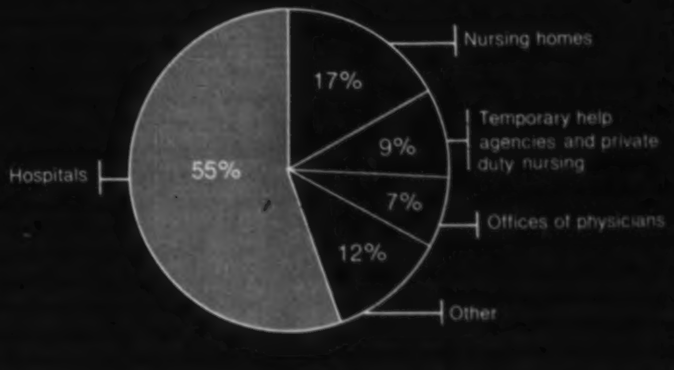
In addition, home health agencies are expected to call upon the skills of personnel more highly trained than LPN's. Home delivery of complex treatments such as kidney dialysis, chemotherapy, antibiotic therapy, and intravenous nutritional therapy is expected to heighten demand for registered nurses—but not for LPN's—in many home health agencies. In addition, reimbursement policies favor use of registered nurses in formal home health care programs. A growing number of licensed practical nurses specialize in home care, but they generally work on a private duty basis, contracting directly with patients (or their families), or working through a nursing registry or temporary help agency.

The number of elderly and disabled persons in need of long-term care is rising rapidly. This will produce exceptionally rapid growth in the nursing home sector during the coming decade, spurring job growth for LPN's. Nursing home regulations encourage utilization of LPN's: States typically require specified levels of staffing by licensed nursing personnel in nursing homes, but do not distinguish between LPN's and RN's, except in the position of nursing director. This encourages facilities to hire LPN's since they are paid less than RN's. Taken together, industry growth and facility staffing patterns

Taking vital signs is part of a licensed practical nurse's normal routine.

More than half of all licensed practical nurses work in hospitals.

Distribution of employment, 1984



SOURCE: Bureau of Labor Statistics

are expected to generate a substantial number of LPN jobs in nursing homes. Very rapid growth also is expected in the number of nonlicensed personal care facilities, which should produce additional job opportunities for LPN's. The number of LPN's in private duty nursing is growing rapidly as well. Overall, the 1990's will see the emergence of long-term care as a major area of employment for LPN's.

As in most other occupations, replacement needs will be the main source of jobs, despite the fact that LPN's show an unusually strong attachment to their field. Compared to workers in other occupations requiring a similar amount of training, LPN's are much less likely to transfer to other jobs. Individuals who stop working as practical nurses tend to stop working altogether. LPN's not currently active in the field thus augment the supply of approximately 40,000-45,000 persons who complete formal training programs each year.

Earnings

Median annual earnings of LPN's who worked full time in 1984 were about $15,000. The middle 50 percent earned between $13,000 and $17,000. The lowest 10 percent earned $11,000 or less. The top 10 percent earned more than $20,000.

LPN's in nursing homes had median annual salaries of $13,500 in 1984, according to a survey by the Hospital Compensation Service.

Starting salaries of LPN's employed in hospitals, medical schools, and medical centers averaged about $13,600 a year in 1984, according to a national survey conducted by the University of Texas Medical Branch. Experienced LPN's averaged about $17,800.

In 1985, the Veterans Administration paid LPN's with no experience annual salaries of $11,458. LPN's with 6 months of experience received $12,862 and those with 1 year, $14,390. LPN's employed by the Federal Government earned an average of about $15,500 in 1984.

Many hospitals give pay increases after specific periods of satisfactory service. Paid holidays and vacations, health insurance, and pension plans are typical benefits provided by hospitals.

Related Occupations

Other jobs that involve working closely with people while helping them include: Emergency medical technician, social service aide, and teacher aide.

Sources of Additional Information

A list of State-approved training programs and information about practical nursing is available from:

Communications Department, National League for Nursing, 10 Columbus Circle, New York, N.Y. 10019.

National Association for Practical Nurse Education and Service, Inc., 10801 Pear Tree Lane, Suite 151, St. Louis, Mo. 63074.

For information about a career in practical nursing, contact:

National Federation of Licensed Practical Nurses, Inc., P.O. Box 11038, Durham, N.C. 27703.

Information about employment opportunities in Veterans Administration medical centers is available from local VA medical centers and also from:

Recruitment and Placement Service, Veterans Adiminstration, 810 Vermont Ave. NW., Washington, D.C. 20420.

For information on nursing careers in hospitals, contact:

American Hospital Association, Division of Nursing, 840 North Lake Shore Dr., Chicago, Ill. 60611.

For a copy of *Health Careers in Long-Term Care*, write:

American Health Care Association, 1200 15th St. NW., Washington, D.C. 20005.

Medical Record Technicians

(D.O.T. 079.367-014)

Nature of the Work

A medical record is a permanent document giving a complete account of a person's illness or injury and the medical services rendered while in a health care facilty. Ordinarily, it includes such items as a patient's medical history, results of physical examinations, reports of X-ray and laboratory tests, diagnosis and treatment plans, doctors' orders and notes, and nurses' notes. This record shows at a glance what treatment has been given and what treatment is planned for the patient. Medical records also are used for research, insurance claims, legal actions, professional review of treatment and medications prescribed, and for training of medical personnel. In addition, medical records are used to evaluate the quality and cost of various medical and surgical procedures, and to plan health care in the community.

Managing an information system that meets medical, administrative, ethical, and legal requirements involves the teamwork of *medical record administrators*, *medical record technicians*, and *medical record clerks*, known collectively as medical record personnel. Directing the activities of the medical record department is the medical record administrator, whose job it is to develop systems for documenting, storing, and retrieving medical information. Administrators train and supervise the medical record staff. They are responsible for compiling statistics required by Federal and State agencies, assisting the medical staff in evaluations of patient care or research studies, and may be required to testify in court about records and record procedures.

Prospective payment, Medicare's new method of paying hospitals for inpatient care based on physician diagnosis, has thrust medical records into the limelight in most hospitals. Increasingly, medical record administrators are viewed as key members of the management team, and they work closely with the finance department to monitor hospital spending patterns. The goal is to improve efficiency without sacrificing quality of care.

Medical record technicians are the people who actually handle the records, organizing and evaluating them for completeness and accuracy. Using standard classification systems, they code symptoms, diseases, operations, procedures, and therapies, and post these codes on patients' records to facilitate retrieval of information at a later time. Using standard definitions, technicians list each patient's primary and secondary diagnoses. The technician is also responsible for coding each diagnosis and entering these codes into a computer. In addition, technicians prepare records for microfilm or microfiche storage.

Technicians assist the medical staff by tabulating data from records for research purposes and may, for example, maintain special registries showing occurrences of disease by type, such as cancer, injury, or stroke. Technicians also maintain health record indexes and compile administrative and health statistics for public health officials, administrators, planners, and others.

In response to inquiries from law firms, insurance companies, and government agencies, medical record technicians gather statistics and prepare reports on such topics as types of diseases treated, surgery, and use of hospital beds. They may present medical records during legal proceedings.

The day-to-day tasks of medical record personnel vary with the size of the facility. In a small facility, for example, a technician may have full responsibility for managing the record department, whereas in a large facility, technicians are likely to specialize in just one aspect of the work. If the department is large enough to employ medical record clerks, a technician would be responsible for teaching them standardized coding systems. In many nursing homes, a record clerk—working under a consultant who is a Registered Record Administrator (RRA) or an Accredited Record Technician (ART)—is responsible for maintaining the medical record system.

Working Conditions

Medical record personnel generally work a standard 40-hour week. Some overtime may be required. In hospitals where coding and transcription take place 24 hours a day, 7 days a week, medical record personnel work on day, evening, and night shifts. Part-time work is generally available.

The work environment is usually pleasant and comfortable, but some aspects of the job are stressful. The utmost accuracy is essential, and this demands concentration and close attention to detail. The emphasis on accuracy can cause fatigue and mental strain. Medical record technicians who work at video display terminals for prolonged periods may experience eyestrain and musculoskeletal pain.

Employment

Medical record technicians held about 33,000 jobs in 1984. Three out of four jobs were in hospitals. Most of the remainder were in nursing homes, clinics, medical group practices, health maintenance organizations, and other facilities that deliver health care.

In addition, insurance firms, accounting firms, and law firms that specialize in health matters employ medical record technicians to tabulate and analyze data from medical records. Public health departments hire technicians to supervise data collection from health care institutions and to assist in research. Manufacturers of medical record systems, services, and equipment employ them to develop and market their products.

Some medical record technicians provide services to nursing homes on a consultant basis. Other self-employed record technicians specialize in medical transcription—the typing of physicians' records and notes from dictating or recording equipment or, occasionally, from written notes.

Training, Other Qualifications, and Advancement

Most employers prefer to hire graduates of 2-year associate degree programs accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association in collaboration with the American Medical Record Association (AMRA). In 1984, community and junior colleges offered more than 85 accredited programs. Required courses include biological sciences, medical terminology, medical record science, business management, and data processing.

Gaining credentials as a medical record technician is voluntary and is offered through the American Medical Record Association (AMRA), which awards the title of Accredited Record Technician (ART) to those who pass a written examination.

Hospitals often advance promising medical record clerks to jobs as medical record technicians. This generally requires 2-4 years of job experience and successful completion of the hospital's in-house training program. Medical record clerks with several years' experience can advance to the technician level after completing the AMRA Independent Study Program, obtaining 30 credit hours in designated liberal arts, science, and business courses from an accredited college, and passing the ART examination for accreditation.

Job Outlook

Employment is expected to grow much faster than the average for all occupations through the mid-1990's due to the heightened importance of medical records in an era of health care cost containment. Management's need for accurate clinical data for purposes of financial control is expected to spur job growth. Nevertheless, most openings will occur because of replacement needs.

Medical records departments play a key role in keeping hospital costs under control.

Most job openings will be in hospitals. Medical records are pivotal to the hospital's control of its finances under the prospective payment system, and employment of medical record personnel in hospitals is expected to rise sharply due to the greatly increased need for complete, accurate, and timely clinical data. Office hours are expected to expand. Also contributing to projected growth are the likelihood of more detailed record analysis, shortened billing time, additional quality control and management efficiency measures, and increased contact with physicians to clarify entries on the medical record and assure that the record is complete.

Greater need for accurate and up-to-date medical records is not confined to the hospital sector. Health maintenance organizations, surgicenters, medical group practices, nursing homes, and home health agencies share the need for complete and timely data for reimbursement purposes, professional review of the quality of care, and financial management. The value of well-maintained medical records in financial management is likely to be an especially important consideration, given the for-profit orientation of many newly emerging health care facilities. This should fuel demand for medical record personnel in a variety of health care settings.

The outlook for experienced technicians who have completed a formal training program will be excellent through the mid-1990's. Demand for experienced or credentialed technicians is expected to be very strong due to the emphasis on accuracy in coding and abstracting data. New graduates, too, are expected to encounter an extremely favorable job market. Graduates are reported to be in great demand, and the number of people completing training programs is expected to fall short of that needed to fill job openings.

Jobseekers without formal training in medical record technology will probably not be hired as medical record technicians since highly accurate coding and abstracting skills are essential. Such individuals may be hired as medical record clerks, however, with the prospect of promotion to positions as medical record technicians once they master the requisite skills.

Earnings

Earnings of medical record technicians vary according to locality. Beginning technicians in hospitals and medical schools averaged $13,200 in 1984, according to a national survey conducted by the University of Texas. Experienced technicians in hospital record departments averaged about $16,700. Some earned over $20,000 a year.

In 1984, medical record technicians employed by the Federal Government averaged about $15,600 a year. Outstanding record technicians may work up to higher supervisory positions with corresponding pay increases, although Registered Record Administrators fill most positions.

Like other hospital employees, medical record personnel generally receive paid holidays and vacations, health insurance, life insurance, and retirement benefits.

Related Occupations

Medical record technicians perform a variety of technical and clerical duties, including verification, transcription, and filing. Other workers with similar duties include information clerks, insurance clerks, library technical assistants, medical secretaries, and medical transcriptionists.

Sources of Additional Information

A list of CAHEA-approved programs for medical record technicians, information about independent study programs, and general information on careers in medical record management is available from:

American Medical Record Association, Suite 1850, 875 N. Michigan Ave., Chicago, Ill. 60611.

Radiologic Technologists

(D.O.T. 078.161-018, .162-010, .361-018 and -034, .362-026 and .364-010)

Nature of the Work

The field of radiology had its beginnings in 1895, when Wilhelm Roentgen discovered X-rays, which permit a physician to view the interior of the human body and diagnose conditions such as fractures, ulcers, blood clots, and tumors. With the application of computer technology to radiology during the 1970's, the field has been revolutionized. Today, the chances of obtaining an accurate diagnosis are vastly improved as vague symptoms are routinely transformed into sharp, clear pictures. Sophisticated computer imaging devices can screen nonsurgically for disorders, often on an outpatient basis. This means less risk for the patient than in the past, when there often was no alternative to invasive tests and exploratory surgery.

New applications of radioisotopes and radioactive tracers led to the growth of nuclear medicine, while the invention of therapeutic X-ray machines led to the birth of radiation therapy, also known as radiation oncology. More recently, advances in computer technology have made possible such imaging systems as computed tomography, ultrasound, digital subtraction radiology, and magnetic resonance, all of which provide physicians with a good "look" at internal organs with little risk to the patient. Although discovered many years ago, some of these imaging techniques have become clinically practical only during the last decade, thanks to improvements in electronic circuitry that enable computers to handle the vast amount of data involved in a single test.

One system coming into use promises to provide more than just imaging capabilities. Nuclear magnetic resonance, or magnetic resonance imaging (MRI) as it is increasingly known, has the potential to provide valuable information about body chemistry—a step that ordinarily requires exploratory surgery to remove samples of body tissues for testing. MRI represents a new generation in medical diagnostics and is a potential competitor with computed tomography for the diagnosis of brain, brain stem, and spinal cord cases because it provides very effective imaging of soft tissues. Magnetic resonance imaging can also identify multiple sclerosis, for example, or show the effects of a heart attack as it is happening. Magnetic resonance scanners employ huge superconductive magnets and radio waves to reveal detailed information about the body's anatomy and chemical composition. The information is processed by a computer and the resulting image displayed on a videoscreen in a control room. While some analysts believe MRI will be a "boom technology," it is difficult to predict how rapidly the new, extremely expensive, equipment will be put into place.

Operators of radiologic equipment are called radiologic technologists. They should not be confused with radiologists—physicians who specialize in the interpretation of radiographs. These workers are still known as X-ray technologists in some places. However, as imaging technologies based on concepts other than X-ray exposure have come into use, radiologic technologist has become the standard job title.

Most technologists operate equipment that is used for diagnostic imaging: X-ray machines, fluoroscopes, computed tomography (CT) scanners, magnetic resonance scanners, and ultrasonic scanners, for example. Radiation is used for treatment, not just for diagnosis, and a distinction is drawn between *radiation therapy technologists*, on the one hand, and *diagnostic radiologic technologists* or *radiographers*, on the other. The emergence of nuclear medicine, ultrasound, and magnetic resonance imaging has created additional job titles.

Before a radiologic technologist can perform any work on a patient, a physician must issue a requisition for the work. Similar to prescriptions for drugs, these requisitions assure that radiologic technologists examine or treat only people certified by physicians as needing such studies or treatment. At all times, technologists must follow precisely not only physicians' instructions but also regulations concerning use of radiation to insure that they, patients, and coworkers are protected from its dangers.

Because radiologic technologists often work with patients who cannot help themselves, good health, moderate strength, and stamina are important. A sympathetic and understanding manner is helpful, for technologists need to give clear instructions and explanations to patients who often are worried and anxious. Patients may be very ill or dying. Radiation therapy technologists in particular are called upon to develop a close and compassionate relationship with patients and their families, for in contrast to other areas of radiology, these technologists are likely to administer therapy to cancer patients every day for several weeks or more. In all areas of radiologic technology, it is not uncommon for patients to have breathing difficulties or to go into shock or cardiac arrest; if this happens, the technologist must be ready to assist until other medical personnel can be called in.

Radiographers take X-ray films (radiographs) of all parts of the human body for use in diagnosing medical problems. They prepare patients for radiologic examinations, assuring that they remove any articles, such as belt buckles or jewelry, through which X-rays cannot pass. Then they position the patients, who either lie on a table, sit, or stand, so that the correct parts of the body can be radiographed, always taking care not to aggravate injuries or make the patients uncomfortable. To prevent unnecessary radiation exposure, the technologist surrounds the exposed area with radiation protection devices, such as lead shields, or in some way limits the size of the X-ray beam.

After the necessary preparations, the technologist positions the radiation equipment at the correct angle and height over the appropriate area of a patient's body. Using instruments similar to a measuring tape, the technologist measures the thickness of the section to be radiographed and then sets the controls on the machine to produce radiographs of the right density, detail, and contrast. The technologist then places a properly identified X-ray film of the correct size under the part of the patient's body to be examined, and makes the exposure. Afterward, the technologist removes the film and develops it. Throughout the procedure, the technologist is careful to use only as much radiation as is necessary to obtain a good diagnostic examination.

Before a radiologist examines a patient by fluoroscopy (watching a patient's internal organs on a monitor or screen), the radiologic technologist prepares a solution of contrast medium for the patient to drink. As this solution passes through the patient's digestive tract, for example, the radiologist looks for diseases, injuries, or defects in the patient's digestive system. When fluoroscopic examinations are performed, whether on the digestive tract or on other parts of the body such as chest, heart, or blood vessels, the technologist assists the physician by preparing and positioning the patient, adjusting the machine, applying the correct exposure, and making any necessary followup radiographs.

Nuclear medicine technologists (D.O.T. 078.361-018), also known as radioisotope technologists, participate in or direct various activities involving radiopharmaceuticals in medical diagnosis and treatment. They may work directly with patients; conduct laboratory studies; do research; or handle administrative functions relating to the purchase, use, and disposal of radioactive isotopes and safety procedures required in using them.

Nuclear medicine technologists calculate and prepare the correct dosages of radionuclides or radiopharmaceuticals given to patients by mouth, injection, or other means and then position the patient for the imaging procedures. Using special equipment, technologists make images of the radioisotopes or radionuclides as they pass through or localize in different parts of a patient's body. They view images on a screen or on films to detect the existence of pathologic conditions, which are determined by the distribution of radioactive isotopes in various organs, glands, and body systems. This information is used by physicians in diagnosis. Small quantities of radioactive isotopes may be administered to a patient, and body specimens, such as blood and urine, collected and measured for radioactivity level. Radioactive substances may also be added to body specimens to determine hormone and drug content.

Other responsibilities include insuring that radiation safety procedures are carefully followed by all workers in the nuclear medicine laboratory and that complete and accurate records are kept. This includes patient medical records, patient procedures performed, and amounts and kinds of radioisotopes received, used, and disposed of.

Radiation therapy technologists (D.O.T. 078.361-034) treat cancer patients. They prepare patients for radiotherapy and administer prescribed doses of ionizing radiation to diseased body areas. Technologists operate various kinds of equipment, including high-energy linear accelerators and particle generators. They must position patients under the equipment with absolute accuracy, in order to expose diseased body areas to treatment while protecting the rest of the body from radiation.

Radiation therapy can produce side effects such as nausea and vomiting. Hair loss and redness of skin can also occur in exposed areas, so the technologist must observe the patient's reactions and keep the physician informed.

Other responsibilities include assisting in maintaining the proper operation of controlling devices and equipment, observing safety measures for patients and clinical personnel, and keeping or helping keep patient records, as well as assisting in the preparation and handling of radioactive materials used in treatment procedures.

With additional education, available at major cancer centers, radiation therapy technologists can specialize and become medical radiation dosimetrists. In this specialty, they work with health physicists in determining the best radiation dosages for various problems as well as the special devices needed to expose only a small section of a body part to radiation.

Ultrasound technologists (D.O.T. 078.364-010), also known as sonographers, use non-ionizing equipment to transmit sound waves at high frequencies into the patient's body, then collect reflected echoes to form an image. The image, which results from the "bounce-back" of sound from the areas being scanned, is viewed on a screen and may be automatically recorded on a printout strip or photographed from the screen for permanent records and for use in interpretation and diagnosis by physi-

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Proper positioning of patient and equipment is crucial for obtaining good X-rays.

cians. Ultrasound images can be displayed as moving pictures—an important feature for cardiovascular and prenatal studies. Ultrasound has quickly become a mainstay in obstetrics and gynecology, and is coming into widespread use in other clinical areas as well.

Sonographers select equipment appropriate for use in ultrasound tests ordered by physicians. They also check the patient's other diagnostic studies for information. Sonographers explain the procedure, record any additional medical history considered necessary, and then position the patient for testing. Viewing the screen as the scanning device is moved over the patient's body, sonographers must be able to recognize subtle differences between healthy and pathological areas, to check for factors such as position, obstruction, or change of shape; and to judge if the images are satisfactory for diagnostic purposes. A high degree of technical skill and knowledge of anatomy and physiology are essential to recognize the significance of all body structures present in the ultrasound image.

In addition to the duties involved in preparing patients and operating equipment, technologists may have administrative tasks. They may prepare work schedules, evaluate equipment, and, in general, manage ultrasound departments or facilities.

Working Conditions

Radiologic technologists generally work a 40-hour week that may include evening and weekend or on-call hours. Technologists are on their feet a lot and may be required to lift or turn disabled patients.

There are potential radiation hazards in this field; however, these hazards have been reduced by the use of safety devices such as instruments that measure radiation exposure, lead aprons, gloves, and other shielding. Because of the presence of radiation and radioactive materials, technologists wear special badges that measure radiation levels while they are in the radiation area. The badge measurement rarely approaches or exceeds established safety levels because of safety programs and built-in safety devices.

Radiologic technologists, radiation therapy technologists, and nuclear medicine technologists are among the occupations covered by the Consumer Patient Radiation Health and Safety Act of 1981, which aims to protect the public from the hazards of unnecessary exposure to medical and dental radiation by making sure that operators of radiologic equipment are properly trained. The act requires the Federal Government to set standards that the States, in turn, may use for accrediting training programs and certifying individuals who engage in medical or dental radiography.

Employment

Radiologic technologists held about 115,000 jobs in 1984. Many worked part time and most were radiographers. Nuclear medicine technologists, radiation therapy technologists, and sonographers hold a relatively small proportion of the jobs in this field.

About 2 out of every 3 jobs are in hospitals. The rest are located in physicians' and dentists' offices, clinics, and laboratories. About 3,100 radiologic technologists worked for the Federal Government in 1984: these included 2,700 diagnostic radiographers, 300 nuclear medicine technologists, and approximately 100 radiation therapy technologists.

Many technologists work part time.

Training, Other Qualifications, and Advancement

Preparation for this field is offered at the postsecondary level in hospitals, medical centers, colleges and universities, trade schools, vocational-technical institutes, and the Armed Forces. Hospitals, which employ most radiologic technologists, prefer to hire individuals who have completed a formal training program. Those employed in physicians' offices may be trained on the job, however.

Formal training programs are offered in radiography, nuclear medicine technology, radiation therapy technology, and diagnostic medical sonography (ultrasound). These programs vary in a number of respects: Length of training, prerequisities, class size, and cost. Programs range in length from 1 to 4 years and lead to a certificate, associate degree, or bachelor's degree. Two-year programs are most prevalent, however.

Magnetic resonance imaging is a new field, and no formal programs have yet been developed to prepare technologists to operate MRI scanners. Most training is provided by hospitals and equipment manufacturers. Radiologic technologists are among those most often chosen to train on the equipment.

Some of the 1-year certificate programs are designed for individuals from other health professions who wish to change fields—medical technologists, registered nurses, and respiratory therapists, for example. Certificate programs also attract radiologic technologists interested in developing a specialization in nuclear medicine, radiation therapy, or ultrasound technology. A bachelor's or master's degree in one of the radiologic technologies is desirable for supervisory, administrative, or teaching positions.

The Committee on Allied Health Education and Accreditation (CAHEA) accredits most formal training programs for this field. Approximately 1,020 CAHEA-accredited programs graduated about 8,800 persons in 1984: 7,400 in radiography, 800 in nuclear medicine technology, 500 in radiation therapy technology, and 100 in diagnostic medical sonography.

Radiography programs require, at a minimum, a high school diploma or the equivalent. High school courses in mathematics, physics, chemistry, and biology are helpful. The programs provide both classroom and clinical instruction in anatomy, physiology, patient care procedures, physics, radiation protection, principles of imaging, medical terminology, positioning, medical ethics, radiobiology, and pathology.

While it is difficult to generalize about prerequisities for training programs in nuclear medicine, radiation therapy, and diagnostic medical sonography, a health professions background generally is preferred. For some programs, it is essential. About half of the CAHEA-accredited radiation therapy programs, and several of the diagnostic medical sonography programs, accept applications only from radiologic technologists and registered nurses. Nuclear medicine technology programs accept medical laboratory technologists as well as radiologic technologists and nurses. Nuclear medicine programs that do not require a health professions background generally expect applicants to have completed 2 to 3 years of college; many require a bachelor's degree.

Procedures for acquiring professional credentials in radiologic occupations include licensure—required by law in some States—and certification or registration, which is voluntary. Many jobs are open only to registered or registry-eligible technologists. Hospitals, for example, generally require CAHEA-accredited training plus credentials in the appropriate radiologic technology. Public health departments and private physicians are more likely to hire workers without such credentials.

The number of States that regulate the practice of radiologic technology is growing. By 1984, 14 States required radiographers to be licensed. Radiation therapy technologists needed a license in order to work in 10 States, and 4 States required that nuclear medicine technologists be licensed. (Puerto Rico requires a license for the practice of all three specialties: Radiography, radiation therapy technology, and nuclear medicine technology.)

Registration is offered by the American Registry of Radiologic Technologists (ARRT) in three technologies: Radiography, radiation therapy, and nuclear medicine. Credentials in nuclear medicine technology are awarded by the Nuclear Medicine Technology Certification Board (NMTCB). The American Registry of Diagnostic Medical Sonographers (ARDMS) certifies the competence of ultrasound technologists.

With experience and additional training, staff technologists in large radiography departments may be promoted to positions that require advanced skills in special procedures including CT scanning, ultrasound, and angiography, or they may move into supervisory positions such as quality assurance technologist, chief technologist, and—ultimately—department administrator or manager. Some technologists progress by becoming instructors or directors in radiologic technology programs; others take jobs as sales representatives or instructors with equipment manufacturers.

Job Outlook

Employment in the field of radiologic technology is expected to grow faster than the average for all occupations through the mid-1990's, reflecting the importance of these technologies in the diagnosis and treatment of disease. Nonetheless, most openings will come from the need to replace experienced technologists who leave the profession.

Supply/demand conditions in radiologic technology have been characterized by regional imbalances for some time. The ample supply of trained radiographers in suburban areas and big cities stands in contrast to chronic shortages in rural areas and small towns. Current imbalances could intensify as a result of far-reaching changes now taking place in the health care system.

In the years ahead, a growing number of radiologic technologists will find jobs in offices of physicians, radiology clinics, health maintenance organizations, and other outpatient settings. Facilities such as these are expected to experience exceptionally rapid growth through the mid-1990's. This trend reflects increased competition for patients, a shift toward outpatient care, and technological advances (remote transmission of X-rays, for example) that permit procedures to be performed outside the hospital setting.

Hospitals are under pressure to keep costs under control. Fewer of the new jobs for radiologic technologists will be in hospitals, a result of administrators' efforts to reduce the number of tests per patient and to discourage procedures that mean revenue losses for the hospital. Some radiologic procedures, however, produce cost savings—those that substitute for more expensive surgical procedures, for example, and those that hasten diagnosis or discharge.

The dominance of the hospital sector means that prospects for radiologic technologists will be better in some localities than in others, depending on conditions in the hospital industry. In communities that experience hospital closings or mergers, for example, the number of openings for trained radiographers could decline precipitously. In addition, hospitals are expected to make greater use of staff "cross-trained" to perform more than one job. This could reduce the number of openings for radiographers in an already well-supplied market. At the same time, hospitals in rural communities are likely to continue to have trouble recruiting and retaining qualified radiographers, especially in specialty areas such as radiation therapy, nuclear medicine, and ultrasound.

Opportunities in radiography vary by specialty. For example, prospects for radiation therapy technologists should continue to be excellent, although it is important to bear in mind that this specialty is very small. Currently, radiation therapy technologists are in great demand, and reports of a shortage are widespread. Trends in the incidence of cancer and other malignancies will continue to be the principal factor affecting demand for these workers. Not only has there been an increase in the number of cancer cases detected, but more cases are being treated by radiation—either alone or in combination with surgery or chemotherapy.

Applications of diagnostic ultrasound are expected to grow very rapidly, in cardiology and obstetrics/gynecology in particular. More widespread use of ultrasound tests will spur demand for diagnostic medical sonographers. They are likely to find jobs in a wide range of health care settings, including offices of physicians, clinics, diagnostic imaging centers, health maintenance organizations, and hospitals.

In nuclear medicine technology, long-range trends are unclear. Employment growth may be constrained by competition from other noninvasive imaging methods, notably CT and magnetic resonance imaging. At the same time, advances in nuclear medicine diagnostics could lead to greater use of nuclear medicine procedures. The use of radiopharmaceuticals, in combination with monoclonal antibodies, is just one illustration of the enormous diagnostic potential of nuclear medicine. Monoclonal antibodies have an affinity for tumors. When radioactively marked, they are easily followed by scanning equipment as they gather around otherwise invisible parts of the body. They can be used to detect cancer, for example, at far earlier stages than is customary today, and without resort to surgery.

It is difficult to say whether technological progress or financial restraint will have the greater effect on job growth in radiologic technology through the mid-1990's. Efforts to bring health care spending under control will certainly affect employment. Innovations in health care financing have already begun to change the way physicians and hospitals provide care. Physicians are under pressure to be selective about ordering diagnostic radiology services, and many hospitals are reluctant to approve outlays for costly new technology and equipment. If they gain momentum, trends such as these could cause employment of radiologic technologists to grow less rapidly than currently anticipated.

Long-term prospects for radiologic technologists will also be influenced by future trends in enrollments in formal training programs, which are expected to level off or possibly decline during the 1980's due to the sharp decrease in the college-age population. A stable or somewhat smaller supply of newly qualified technologists would create a favorable situation for jobseekers, provided the number of qualified workers seeking to reenter the occupation remains about the same.

Earnings

Starting salaries of radiologic technologists employed in hospitals, medical schools, and medical centers averaged about $15,700 a year in 1984, according to a national survey by the University of Texas Medical Branch. Experienced radiologic technologists averaged about $24,100 a year.

Workers with specialized skills earn more. Ultrasound technologists started at about $17,900 in 1984, according to the University of Texas survey; radiation therapy technologists, at about $18,000; and nuclear medicine technologists, at $18,000 a year. Experienced ultrasound technologists averaged $26,300 a year. Experienced radiation therapy technolgists averaged $25,700, and experienced nuclear medicine technologists earned $25,900 a year, on the average.

In 1985, the Federal Government offered salaries of about $14,400 a year to radiologic technologists in entry level positions. Average Federal salaries in 1984 were about $18,600 a year for diagnostic radiologic technologists, $20,000 for radiation therapy technologists, and $20,000 for nuclear medicine technologists.

Sick leave, vacations, health insurance, and other benefits are comparable to those covering other workers in the same organization.

Related Occupations

Radiologic technologists operate sophisticated equipment to help physicians, dentists, and other health practitioners diagnose and treat patients. Workers in related occupations include dental hygienists, electrocardiograph technicians, cardiology technologists, electroencephalographic technicians and technologists, perfusionists, respiratory therapists, and clinical laboratory technologists.

Sources of Additional Information

For career information, enclose a stamped, self-addressed business size envelope with your request to:

American Society of Radiologic Technologists, 15000 Central Ave. SE., Albuquerque, N. Mex. 87123.

Society of Nuclear Medicine, 136 Madison Avenue, New York, N.Y. 10016.

Society of Diagnostic Medical Sonographers, 10300 N. Central Expressway Building 1, Suite 276, Dallas, Tex. 75231.

Information about a career in radiation therapy technology is also available from:

Vice President for Professional Education, American Cancer Society, 90 Park Ave., New York, N.Y. 10016.

For the current list of accredited education programs in radiography, radiation therapy technology, nuclear medicine technology, or diagnostic medical sonography, write:

Division of Allied Health Education and Accreditation, American Medical Association, 535 N. Dearborn St., Chicago, Ill. 60610.

Surgical Technicians

(D.O.T. 079.374-022)

Nature of the Work

Surgical technicians, also called surgical technologists or operating room technicians, assist surgeons, anesthesiologists, and others before, during, and after surgery. They work principally under the supervision of registered nurses.

They help set up the operating room with surgical instruments, equipment, sterile linens, and fluids such as glucose that will be needed during an operation. Surgical technicians also may prepare patients for surgery by washing, shaving, and disinfecting body areas where the surgeon will operate. They may transport patients to the operating room and help drape them and position them on the operating table.

During surgery, they pass instruments and other sterile supplies to the surgeons and the surgeons' assistants. They hold retractors, cut sutures, and help count the sponges, needles, supplies, and instruments used during the operation. Surgical technicians help prepare, care for, and dispose of specimens taken for laboratory analysis during the operation and help apply dressings. They may operate sterilizers, lights, suction machines, and assist with the operation of diagnostic equipment.

After the operation, surgical technicians may help transfer patients to the recovery room and assist nurses in cleaning and stocking the operating room for the next operation.

Working Conditions

Surgical technicians work in clean, well-lighted, cool environments. They need stamina to be on their feet the whole time they are on duty and to pay close attention to detail during operations.

Most surgery is performed during the day, but some work places, such as emergency surgical units, require 24-hour coverage. A 40-hour, 5-day workweek is normal for surgical technicians, although many are required at times to be "on call" (available to work on short notice for emergencies).

Employment

Surgical technicians held about 36,000 jobs in 1984. In a few regions of the country, technicians known as private scrubs are employed directly by surgeons. Most, however, are employed by hospitals and other places that have operating room, delivery room, and emergency room facilities.

Training, Other Qualifications, and Advancement

Nearly all technicians receive their training in formal programs offered by community and junior colleges, vocational and technical schools, or hospitals. Although most programs last from 9 to 10 months, some community college programs last 2 years and lead to an associate degree. In 1984, there were 203 training programs for surgical technicians, of which 103 were accredited by the Committee on Allied Health Education and Accreditation of the American Medical Association. High school graduation normally is required for admission.

Accredited programs provide classroom training as well as supervised clinical experience. Required courses include anatomy, physiology, and microbiology. Other courses include the care and safety of patients during surgery, use of anesthesia and its hazards, and surgical care procedures. Students also learn how to sterilize instruments; prevent and control infection; and handle special drugs, solutions, supplies, and equipment.

Some surgical technicians receive their training in hospital-based programs that last from 6 months to 1 year, depending on the program's admission requirements. The shorter programs are designed for licensed practical nurses, who already have some background in anatomy, physiology, and clinical practice. The longer programs, from 9 months to a year, are for individuals with no background in health care.

Some surgical technicians are trained in the Armed Forces. Regardless of where they are educated and trained, surgical technicians are expected to keep abreast of new developments in the field. With additional training, they can work with new equipment such as lasers and assist in complex procedures such as open heart surgery.

Obtaining professional credentials for this occupation is voluntary; the Liaison Council on Certification certifies technicians who demonstrate entry level knowledge by successfully passing a national certification examination. Continuing education or reexamination is required to maintain certification, which must be renewed every 6 years.

Manual dexterity is a necessity for surgical technicians because they must handle instruments quickly, often having to anticipate which instrument is needed. They must be conscientious, orderly, and emotionally stable. In surgery, there is little margin for error. High school students interested in careers in this occupation are advised to take courses in health and biology.

Some surgical technicians advance to supervisory or administrative positions. They may be promoted to operating room administrator, for example, who deals with the day-to-day running of an operating room, or they may direct a hospitalwide sterile supply service.

A surgical technician preparing for an operation.

Job Outlook

Employment in this field is expected to grow about as fast as the average for all occupations through the mid-1990's. As in other occupations, most job openings will result from the need to replace experienced workers who transfer to other occupations or stop working altogether.

Future prospects for surgical technicians will be affected by both the rising volume of surgery and shifts in surgical practice patterns. The number of surgical procedures is expected to grow rapidly due to population growth, the increasing number of older people, technological advances that permit surgical intervention for more conditions than ever before, and widespread insurance coverage for surgical care.

The rate of surgery has climbed steadily among persons 65 years of age and above. Elderly patients typically undergo surgery for cataracts, hip replacements, hernia repair, or prostate repair or removal, for example. As new procedures and improvements in technology continue to make surgery less risky and more successful, the potential benefits to elderly patients increasingly outweigh the risks. Rapid growth of the 65-and-over population in the years ahead is almost certain to sustain a high level of demand for surgery.

Surgical practice patterns are changing, however; the dominant trend is a shift to outpatient or ambulatory surgery. Advances in laser technology, fiber optics, and anesthesia have made it possible for many more procedures to be performed on an outpatient basis, while the effort to contain health care costs has created a powerful incentive to do so. Some health insurance plans, for example, cover the full cost of outpatient surgery but pay only part of the cost if the same procedure entails a hospital stay. As a result, a growing number of surgical procedures are being performed by surgeons in hospital outpatient departments, which employ surgical technicians as assistants. Ambulatory surgery is performed in physicians' offices, clinics, and freestanding surgicenters, but relatively few surgical technicians are employed in these settings. Depending on how much surgery shifts away from hospitals, therefore, job growth for surgical technicians could be curtailed—despite the rising volume of surgery.

Cost-cutting measures within hospitals could also dampen employment growth: Some hospitals are trying to hold down labor costs by reducing the number of employees with only one skill and putting greater emphasis on "multicompetent" staff who have the training to perform a variety of tasks. In the operating room, this could mean greater reliance on registered nurses and fewer positions for nursing assistants and surgical technicians.

Earnings

The average starting salary for surgical technicians was about $12,700 a year in 1984, according to a national survey by the University of Texas Medical Branch. Experienced technicians earned an average salary of approximately $16,800 annually. Surgical technicians employed by the Federal Government are classified as nursing assistants. Starting salaries ranged from about $10,498 to $18,603 in 1984, depending on education and experience.

Salaries vary widely by geographic location, with those on the east and west coasts generally higher. Surgical technicians employed by surgeons tend to earn more than those employed by hospitals and similar institutions.

Related Occupations

Other workers who perform medical activities under supervision are chiropractor assistants, dental assistants, electrocardiograph technicians, electroencephalographic technologists, licensed practical nurses, medical assistants, nursing aides, occupational therapy assistants, orderlies, and physical therapy aides.

Sources of Additional Information

Additional information on a career as a surgical technician, on training programs for the occupation, and on certification is available from:

Association of Surgical Technologists, 8307 Shaffer Parkway, Caller No. E, Littleton, Colo. 80120.

Writers, Artists, and Entertainers

Creativity, imagination, and talent are prerequisites for a career as a writer, artist, or entertainer. People in these fields use a variety of media to express ideas and emotions and to describe and interpret the human experience.

For writers and others in communication occupations, language is a "tool of the trade." They use the written or spoken word to inform, persuade, or entertain—or to express their own individuality. Poets, playwrights, lyricists, novelists, and short-story writers use language primarily for creative expression. Among those who use language to inform or persuade are journalists, speech writers, script writers, technical writers, and advertising copy writers. Some people in communications occupations do relatively little writing. Among them are editors, who revise and coordinate the work of others; proofreaders, who read and correct copy; literary agents, who appraise manuscripts for publication; and radio and television announcers and interpreters, who rely on the spoken word to do their jobs.

Artists and others in design occupations use visual means such as light, space, color, form, and texture to convey feelings or create a particular effect. They need esthetic sensitivity, color sense, and talent. A fine artist creates a painting or sculpture primarily to express an emotion or idea. Applied artists create esthetically pleasing objects that serve a practical purpose. Working by hand, for the most part, they employ artistic skills and techniques to produce utilitarian objects. The design field includes people as diverse as sculptors, graphic and fine artists, sign painters, illustrators, photographers, engravers, painting restorers, prop makers, silversmiths, decorators, exhibit designers, clothing designers, and furniture designers.

Performing artists and entertainers express themselves through music, drama, dance, or movement. Whereas writers and visual artists can capture a moment forever by transferring it to paper or canvas, performing artists express their creativity through a "performance." And no two live performances are exactly the same. Performing artists may use their talent to say something serious or profound about the human condition or they may simply provide entertainment. Because communicating with an audience is such an integral part of the performer's art, stage presence and rapport with an audience are qualities an artist must develop and refine. Actors and actresses, singers, dancers, musicians, comedians, magicians, mimes, trapeze artists, and figure skaters are just a few of the many different entertainment occupations.

In some of these occupations, particularly those in the performing arts, few jobs offer permanent employment; most are short-term engagements. With an oversupply of qualified people vying for work, many writers, artists, and entertainers have to settle for occasional or part-time employment in their chosen field. The rest of the time, they study, practice, and take temporary jobs unrelated to their art—such as waiting on tables or sales clerking.

People who aspire to a creative career need to be realistic about their talent, for that is what counts most in getting a job or establishing a reputation. Practical experience—in local theatrical productions or on a community newspaper, for example—can help in getting started. However, even very talented people must be willing to spend years mastering a skill and then wait for a "break"—an opportunity to perform, to exhibit their work, or to have a manuscript published. Writers, artists, and entertainers need to be flexible enough to cope with job insecurity and willing to live on an irregular income. Job prospects in a number of creative occupations are described in the statements that follow.

Communications Occupations

The art of communications is as old as humanity. Its importance in modern society becomes apparent when you try to imagine the world without radio, television, newspapers, magazines, or books. From the earliest discoveries of papermaking techniques to today's use of computers and satellites that transmit information around the world instantaneously, people have sought ways of recording the events around them and conveying the information to others. Communication is the process of transmitting information to an audience through a variety of media.

The communications field includes a broad range of occupations having to do with research, writing, editing, and production. It encompasses educational, medical, business, speech, joke, screen, and fiction writing; and interpreting, translating, public relations, advertising, and many other specialties. This section of the *Handbook* describes four of these occupations—reporters and correspondents, public relations specialists, radio and television announcers and newscasters, and writers and editors.

Communications occupations require a broad education, with preparation either in the liberal arts and humanities or in a scientific or technical field, depending on specific career interest. The intellectual habits acquired during college are important. Acute powers of observation and the ability to think clearly and logically are necessary traits, because people in these jobs need to understand the significance of the events they observe. An excellent command of language—both written and oral—is essential. It is through appropriate choice of words or phrases that writers, for example, get the desired effect from their material. A feeling for language enables reporters and correspondents to breathe life and meaning into events that occur every day. A knack for dramatization through the spoken word makes radio and television announcers and newscasters attractive to audiences of all kinds.

In addition to a broad education and outstanding language skills, people in communications jobs may need to be very well informed about a particular subject. Depending on the job, they may need to be versed in economics, law, politics, science, engineering, computer science, education, music, or sports. They may be called upon to explain complex legal issues that arise from a major Supreme Court decision; national economic and political events for readers of a smalltown newspaper; the latest developments in a high-technology field for readers of a trade journal; or the history of jazz, classical, bluegrass, or other music featured on a radio show.

Many communications workers must perform well under pressure. A reporter who misses the deadline on an important story may damage the newspaper's prestige. A television announcer who does not react quickly to emergencies on the air can cause the show's ratings to decline. A public relations worker who gives out incorrect information about a company's operations can damage its public image.

Competition for most communications jobs is keen because the field traditionally attracts many more jobseekers than there are job openings. Some people are attracted by the glamorous image of media jobs—the opportunities to meet public figures, to appear before nationwide audiences, and to attend top newsmaking events. This glamorous aspect of the job obscures the hard work most of these jobs entail. Journalists, for example, spend hours every day on the tedious but essential tasks of making contacts, checking facts, following leads, and writing up their findings.

Despite the keen competition, jobs will be available through the mid-1990's for talented individuals who have acquired appropriate education and experience. Willingness to take a job where one is available in a small town instead of Los Angeles or New York City and willingness to start at the bottom may make the difference between success and failure in breaking into the field. After that, a combination of talent, motivation, imagination, hard work, and luck can lead to a rewarding career.

Public Relations Specialists

(D.O.T. 165.017-010, .067-010, and .167-010)

Nature of the Work

An organization's image, profitability, and even its continued existence can depend on how successfully it presents its goals and policies to the public. Public relations specialists help businesses, governments, universities, hospitals, schools, and other organizations build and maintain positive relationships with the public.

Public relations specialists apply their talents and skills in many different areas. They may handle press, community, or consumer relations, political campaigns, interest-group representation, fundraising, or employee recruitment. Public relations is not only "telling the employer's story," however. Understanding the attitudes and concerns of customers, employees, and various other "publics"—and communicating this information to management to help formulate policy—is also an important part of the job. In improving communications, public relations workers promote understanding and cooperation among the diverse groups that make up our society.

A variety of organizations have public relations departments, and workers must tailor their programs to an employer's particular needs. A public relations director of a college or university, for example, may spend most of the time recruiting a student body, while one in a large corporation may work with stockholders, government agencies, and community groups.

Public relations workers put together information that keeps the public aware of their organization's policies, activities, and accomplishments, and keeps management aware of public attitudes. After preparing the information, they may contact people in the media who might be interested in printing, televising, or broadcasting their material. Many radio or television announcements, special reports, newspaper items, and magazine articles start at the desks of public relations workers. Sometimes the subject is a company and its policies towards its employees or its role in the community. Often the subject is a public issue, such as health, nutrition, energy, or the environment.

Arranging and conducting programs in which company representatives will have direct contact with the public is an important feature of public relations work. Such work includes setting up speaking engagements and helping prepare speeches for company officials. Those workers often represent employers at community projects or occasionally may show films at school assemblies, plan conventions, or manage fundraising campaigns.

Public relations staff members in very large firms may number 200 or more, but in most firms the number is much smaller. The director of public relations, who is often a vice president of the company, may develop overall plans and policies with a top management executive. In addition, large public relations departments employ writers, research workers, and other specialists who prepare material for the different groups the company wishes to reach.

Workers who handle publicity for an individual or direct public relations for a university, small business, or nonprofit organization may handle all aspects of the job. They contact people outside the organization, do the necessary planning and research, and prepare material for distribution. In small firms, these workers may combine public relations duties with advertising or sales promotion work; they may be top level officials or in more junior positions. The most skilled public relations work of making overall plans and maintaining contacts usually is done by the department director and highly experienced staff members.

Working Conditions

Although public relations staffs generally work 35 to 40 hours a week, schedules may be rearranged because public relations programs operate against deadlines. Preparing and delivering speeches, attending meetings and community activities, and out-of-town travel may all be a part of the public relations specialist's routine. Thus, workers occasionally may have to be at the job or on call around the clock.

Employment

About 95,000 jobs were held by public relations workers in 1984. Manufacturing firms, public utilities, transportation companies, insurance companies, and trade and professional associations employ many of them. A sizable number work for government agencies (the Federal Government alone employs several thousand public information specialists), or for schools, colleges, museums, and other educational, religious, and human service organizations. The rapidly expanding health field also offers opportunities for public relations work, in hospitals, pharmaceutical companies, and medical associations, for example. Many workers are employed by public relations consulting firms which serve clients for a fee. Some work for advertising agencies.

Public relations workers are concentrated in large cities where press services and other communications facilities are readily available, and where many businesses and trade associations have their headquarters. Many public relations consulting firms, for example, are in New York, Los Angeles, Chicago, and Washington, D.C. A trend, however, is the dispersal of public relations jobs throughout the Nation, including smaller towns.

Training, Other Qualifications, and Advancement

A college education combined with public relations experience is excellent preparation for public relations work. Although most beginners have a college major in journalism, communications, or public relations, some employers prefer training in a field related to the firm's business—science, finance, or engineering, for example. Regardless of academic background, most entrants transfer from other occupations where they obtained valuable work experience. Many firms seek college graduates who have worked in electronic or print journalism. Others prefer workers with sales, engineering, or other experience that prepares them to deal knowledgeably with the organization's products or services.

In 1984, about 140 colleges and 25 graduate schools offered degree programs or special curriculums in public relations, usually administered by the journalism or communications department. In addition, about 300 colleges offered at least one course in this field. Typical courses include public relations theory and techniques, organizational communication, public relations management and administration, and other courses in public relations. Specialties are offered in public relations in business, government, and nonprofit organizations. Courses in advertising, journalism, business administration, political science, communications, psychology, sociology, and creative writing also help in preparing for a career in public relations. Familiarity with word processing and other computer applications also is helpful. Persons who have a bachelor's degree in public relations or a

Public relations specialists must tailor programs to an employer's particular needs.

related field generally enter staff positions, whereas those with a graduate degree in public relations are more qualified for administrative and managerial jobs.

Extracurricular activities such as writing for a school publication or television or radio station provide valuable experience. Many schools help students gain part-time or summer internships in public relations which provide training that can help in competing for entry positions. Membership in the Public Relations Student Society of America provides an opportunity for students to exchange views with public relations workers and to make professional contacts that may help later in securing a full-time job in the field. A portfolio of published articles, television or radio programs, slide presentations, and other work samples usually is an asset in finding a job.

Public relations workers spend much time gathering information. Creativity, initiative, and the ability to express thoughts clearly and simply are important to the public relations worker. Fresh ideas are so vital in public relations that some experts spend all their time developing new ideas.

People who choose public relations as a career need an outgoing personality, self-confidence, and an understanding of human psychology. They should have the enthusiasm for motivating people. The ability to be competitive but function as part of a team are important qualifications.

Public information positions in the Federal Government generally require a college degree. Media, writing, or editing experience may help in gaining such a position. Requirements for similar positions in State and local governments vary.

Some companies—particularly those with large public relations staffs—have formal training programs for new employees. In other firms, new employees work under the guidance of experienced staff members. Beginners often maintain files of material about company activities, scan newspapers and magazines for appropriate articles to clip, and assemble information for speeches and pamphlets. After gaining experience, they work on more difficult assignments, such as writing press releases, speeches, and articles for publication. In some firms, workers get all-round experience whereas in other firms they specialize.

Promotion to supervisory jobs may come as workers show they can handle more demanding and creative assignments. Some experienced public relations workers start their own consulting firms.

The Public Relations Society of America accredits public relations workers who have at least 5 years' experience in the field and have passed a comprehensive 6-hour examination (4 hours written, 2 hours oral). Employers consider professional recognition through such accreditation a sign of competence in this field.

Job Outlook

Employment of public relations workers is expected to increase much faster than the average for all occupations through the mid-1990's. New jobs will result from growth in demand for these workers as corporations, associations, health facilities, and other large organizations expand their public relations staffs. The trend toward the use of public relations specialists by smaller organizations also should stimulate employment growth.

The vast majority of job openings, however, will result from the need to replace workers who leave the occupation. Experience in public relations is good preparation for management and other closely related jobs, and there is a lot of movement into and out of this occupation.

Competition for beginning jobs is keen, for the glamour and excitement of public relations attract large numbers of jobseekers, including many with related experience. Prospects for a career in public relations are best for highly qualified applicants—talented people with sound academic preparation and some media experience.

Earnings

Median annual earnings for public relation specialists who are not self-employed were $25,800 in 1984. The middle 50 percent earned between $21,000 and $40,700 annually; the lowest 10 percent earned less than $13,500; and the top 10 percent earned more than $52,000.

Salaries of experienced workers generally are highest in large organizations with extensive public relations programs. According to a 1984 survey, the median annual salary of top level public relations workers was $44,000. Median annual salaries ranged from about $32,000 in local government to $51,100 in public utilities.

In the Federal Government, persons with a bachelor's degree generally started at $17,000 a year in 1985; those with a master's degree generally started at $21,000 a year. Additional education or experience could qualify applicants for a higher salary. Public information specialists in the Federal Government averaged about $32,400 a year in 1984.

Related Occupations

Public relations workers develop and distribute persuasive material in order to create favorable public attitudes. Other workers with similar jobs include fundraisers, account executives, lobbyists, promotion managers, advertising managers, and police officers involved in community relations.

Sources of Additional Information

Career information and a list of schools accredited by the Public Relations Society of America and the Accrediting Council on Education in Journalism and Mass Communications are available for $1 from:

Career Information, Public Relations Society of America, Inc., 845 Third Ave., New York, N.Y. 10022.

Current information on the public relations field, salaries, and other items is available from:

PR Reporter, Dudley House, P.O. Box 600, Exeter, N.H. 03833.

Additional information on job opportunities and the public relations field in general may be purchased for $1 from:

Service Department, *Public Relations News*, 127 East 80th St., New York, N.Y. 10021.

Radio and Television Announcers and Newscasters

(D.O.T 131.067-010, and -018, .267-010; 159.147-010, and -014)

Nature of the Work

Announcers and newscasters are the most familiar of the many occupations in radio and television broadcasting. At small radio stations, most announcers are also disc jockeys. They introduce recorded music; present news, sports, weather, and commercials; interview guests; and report on community activities and other matters of interest to the audience. Often they "ad-lib" much of the commentary. In small stations, they may also operate the control board, sell commercial time to advertisers, and write commercial and news copy. Many radio stations also have news reporters who broadcast directly from the scene.

Announcers at television stations and large radio stations usually specialize in a particular kind of programming such as sports events, general news broadcasts, or weather reports. They must be thoroughly familiar with these areas and, if a written script is required, may do the research and writing.

Television news broadcasting requires specialized "on-camera" personnel—anchor persons, television news reporters, and broadcast news analysts. In large news operations, such as those of stations in major cities or national networks, all three often take part in the news broadcast.

The news anchor, or a pair of coanchors, presents the day's important news stories. Throughout the broadcast, the anchors, sometimes called newscasters, introduce videotaped news or live transmissions from on-the-scene reporters that provide in-depth information on the event being covered.

Radio and television broadcast news analysts, called commentators, also present current news stories, but normally interpret them or discuss how specific events may affect the Nation or us personally.

Frequently, a smaller television station employs only a news anchor who reads accounts of the day's stories and introduces background reports provided by the networks or by a television news service.

Announcers frequently participate in community activities. A sports announcer, for example, might be the master of ceremonies at a touchdown club banquet or greet customers at the opening of a new sporting goods store. Some announcers become well-known and highly paid personalities.

Working Conditions

Announcers and newscasters usually work in well-lighted, air-conditioned, soundproof studios. However, when broadcasting from a war zone or the site of a civil disturbance, fire, flood, or other emergency situation, newscasters may be exposed to bad weather and long hours and may risk injury.

Working within a tight schedule requires split-second timing and can be physically and mentally demanding. Those who enjoy the work, however, feel that the intangible rewards—creative work, many personal contacts, and the satisfaction of becoming widely known—far outweigh the disadvantages of irregular and often unpredictable hours, work pressures, and disrupted personal lives.

Employment

Radio and television announcers and newscasters held about 56,000 jobs in 1984. Nearly all are staff announcers, but some are freelance announcers who sell their services for individual assignments to networks and stations, or to advertising agencies and other independent producers.

Training, Other Qualifications, and Advancement

Entry to this profession is highly competitive. While formal training in a college or technical school is valuable, station officials pay particular attention to taped auditions that present samples of an applicant's delivery and—in television—appearance and style on commercials, news, interviews, and other copy. College graduates and others hired by television stations usually start out as production secretaries, production assistants, researchers, or reporters and are given a chance to move into announcing if they show an aptitude for broadcasting.

Announcers must have a pleasant and well-controlled voice, good timing, and excellent pronunciation. Correct English usage and a knowledge of dramatics, sports, music, and current events improve chances for success. Good judgment and the ability to react quickly in emergencies are important because announcers may be required to "ad-lib" all or part of a show. A neat, pleasing appearance is essential, of course, for television announcers and news broadcasters. The most successful announcers attract a large viewing or listening audience by combining a pleasing personality with an appealing style.

High school courses in English, public speaking, drama, foreign languages, and electronics, plus sports and music hobbies, are valuable background for prospective announcers. A liberal arts education provides an excellent background for an announcer, and many universities offer courses of study in the broadcasting field. Students at these institutions also may gain valuable experience by supplementing their courses with part-time work at the campus radio station and summer work at local stations, filling in for vacationing staff members. A number of private broadcasting schools offer training in announcing.

A neat, pleasing appearance is essential for television announcers and news broadcasters.

Persons considering enrolling in any school, whether public or private, that offers training for a broadcasting career should contact the personnel managers of radio and television stations and broadcasting trade organizations to determine the school's reputation for producing suitably trained candidates.

Announcers generally get their first broadcasting jobs in a small station. Because announcers in small radio stations sometimes operate transmitters, prospective announcers often obtain a Federal Communications Commission (FCC) restricted radiotelephone operator permit. This qualifies them to become involved in the routine operation of radio transmitters and makes them much more useful to these stations. (For additional information on FCC requirements, see the statement on broadcast technicians elsewhere in the *Handbook*.)

Announcers usually work in several different stations in the course of their career. After acquiring experience at a station in a small community, an ambitious and talented announcer may move to a better paying job in a large city. An announcer also may advance by hosting a regular program as a disc jockey, sportscaster, or other specialist. In the national networks, competition for jobs is particularly intense, and announcers often must be college graduates and have several years of successful announcing experience before they are given an audition.

Job Outlook

Competition for beginning jobs as announcers will be very keen through the mid-1990's. The broadcasting field typically attracts many more jobseekers than there are jobs. It will be easier to get a job in radio than in television because more radio stations hire beginners. Many of these jobs will be in small stations, however, where the pay is relatively low. Because competition for ratings is so intense in major metropolitan areas, large radio and television stations will continue to seek highly experienced announcers and newscasters who have proven that they can attract a large audience.

Employment of announcers is expected to increase about as fast as the average for all occupations through the mid-1990's as new radio and television stations are licensed and the number of cable television systems continues to grow. Employment of radio announcers may not keep pace with the increase in the number of stations, however, because of the increased use of automatic programming equipment. Although announcers are rather strongly attached to their occupation, most openings in this relatively small occupation will arise from the need to replace those who transfer to other fields of work, retire, or die.

Over the years, employment in this occupation has not been significantly affected by downturns in the economy. When poor business conditions and decreasing advertising revenues necessitate employment reductions, radio and television stations tend to cut back the number of production and "behind-the-scenes" workers rather than reduce the number of announcers and broadcasters.

Earnings

Salaries in broadcasting vary widely with the type of station, the size of the market it serves, and with what the announcer has to offer.

Median annual earnings of full-time announcers were about $14,000 in 1984. The middle 50 percent earned between $10,400 and $20,000 yearly; the lowest 10 percent earned less than $9,000; and the top 10 percent earned more than $52,000.

According to a survey conducted by the National Association of Broadcasters, 1984 salaries of radio announcers ranged from a low of $12,000 to a high of $33,000. Salaries of TV announcers ranged from $12,800 to more than $182,000 annually.

Most announcers in large stations work a 40-hour week and receive overtime pay for additional hours. Many announcers in small stations work a considerable amount of overtime. Working hours consist of both time on the air and time spent in preparing for broadcasts. Evening, night, weekend, and holiday duty occurs frequently since many stations broadcast 24 hours a day, 7 days a week.

Related Occupations

The success of radio and television announcers and news broadcasters is largely dependent upon their ability to speak effectively to their audiences. Others for whom oral communications skills are vital are interpreters, narrators, sales workers, public relations workers, and dramatic and comedy performers.

Sources of Additional Information

For a list of schools that offer programs and courses in broadcasting, contact:

Broadcast Education Association, 1771 N St. NW., Washington, D.C. 20036.

For information on FCC licensure, write to:

Federal Communications Commission, 1919 M St. NW., Washington, D.C. 20552.

General information on the broadcasting industry is available from:

National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

For information on careers in the cable industry, write to:

Cable Television Association, 1724 Massachusetts Ave. NW., Washington, D.C. 20036.

Reporters and Correspondents

(D.O.T. 131 except .267-010 and -018; and 132)

Nature of the Work

Reporters and correspondents play an important role in society. They gather information and prepare stories that inform us about local, State, national, and international events; present differing points of view on current issues; and monitor the actions of public officials and others who exercise power. In covering a story, they may do background research, review public records, and interview a variety of people. As a rule, reporters take notes or use a tape recorder while collecting facts and write their stories upon returning to the office. In order to meet deadlines, however, many now use small, easy-to- carry, lightweight computers to enter the story, which is than sent by phone modem to rewriters who write or transcribe the stories for them.

Reporters in radio and television broadcasting often report "live" from the scene of a newsworthy event, where they have to compose their story on the spot. Later, they may do commentary for a film report in the studio and appear on camera to introduce the story.

Large newspaper and radio and television stations frequently assign reporters to investigate specific locations or "beats," such as police stations or the courts, on a regular basis to gather news originating in these places. General assignment reporters write up local news as assigned, such as a story about a school board meeting or an obituary of a community leader. Many newspaper, magazine, and wire service reporters with a background or interest in a particular subject analyze and interpret the news in specialized fields such as medicine, politics, foreign affairs, sports, fashion, art, theater, consumer affairs, travel, finance, social events, science, education, business, labor, and religion. Critics review restaurants and movies as well as literary, artistic, and musical works and live performances, while editorial writers present viewpoints on topics of public interest.

Newspapers, magazines, wire services, and radio and television networks frequently station reporters, known as correspondents, in large cities as well as in other countries to prepare stories on major news events occurring in these locations. Reporters on small newspapers cover all aspects of local news, and also may take photographs, write headlines, lay out pages, edit wire service copy, and write editorials. On some small weeklies, they also may solicit advertisements, sell subscriptions, and perform general office work.

Working Conditions

The work of reporters and correspondents is usually hectic. They are under pressure to meet deadlines and many work under trying conditions. In the office, for example, they often must contend with loud conversation and the confusion of people constantly on the go. When reporting from the scene, radio and television reporters may be distracted by curious onlookers, police, or other emergency workers. Some assignments covering wars, political uprisings, fires, floods, and other events may be dangerous.

Working hours vary by type of employer. Reporters working for morning papers usually work from late afternoon until midnight. Those on afternoon or evening papers generally work from early morning until early or midafternoon. Radio and television reporters generally are assigned to a day or evening shift so that the news can be covered whenever it happens. Although magazine reporters often can schedule their work during the day, all reporters may have to change their work hours to meet a deadline or to update an earlier report because of late-breaking developments. Their work may demand long hours, irregular schedules, and some travel. Foreign correspondents often work late at night to send news to their papers in time for printing deadlines.

Employment

Reporters and correspondents held about 69,000 jobs in 1984. Nearly 3 of every 4 worked for newspapers, either large city daily papers or daily or weekly papers in suburban communities and small towns. Others worked in radio and television broadcasting and for magazines and wire services.

Training, Other Qualifications, and Advancement

Most editors prefer college graduates who have a degree in journalism, which includes training in the liberal arts along with professional training in journalism. A few prefer applicants who have a bachelor's degree in liberal arts and a master's degree in journalism. High school courses in English, journalism, social studies, and typing provide a good foundation. But some large city newspapers prefer a subject-matter specialty helpful to specific beats such as economics, political science, finance, or business. That subject-matter specialty may be one degree with a second degree in journalism.

In 1984, the vast majority of journalism graduates who landed jobs on newspapers, magazines, or with news wire services prepared specifically for news work by majoring in news-editorial journalism.

Bachelor's degree programs in journalism are available in over 300 colleges. About three-fourths of the courses in a typical undergraduate journalism curriculum are in liberal arts, with the remainder required journalism courses. These journalism courses include introductory mass media, basic reporting and copy editing, history of journalism, and press law and ethics. In addition, students planning a career in broadcasting take courses in radio and television newscasting and production. Other journalism courses are selected in the student's specific area of interest.

Over 350 community and junior colleges offer journalism courses or programs. Credit earned at some of these schools may be transferable to 4-year college programs in journalism. Some junior colleges also offer programs especially designed to prepare the student directly for employment as a general assignment reporter. However, such graduates find it increasingly difficult to compete with graduates of 4-year programs. The Armed Forces also provide some training in journalism.

A master's degree in journalism was offered by over 100 schools in 1985; about 20 schools offered the Ph.D. degree. Some graduate programs are intended primarily as preparation for news careers, while others concentrate on preparing journalism teachers, researchers and theorists, and advertising and public relations workers.

Reporters on small newspapers cover all aspects of local news.

Liberal arts courses useful to persons preparing for a reporting career include English courses with an emphasis on writing, sociology, political science, economics, history, psychology, computer science, business, and speech. The ability to read and speak a foreign language also is desirable. Those who aspire to reporting in a specialized field—science or finance, for example—should concentrate on coursework in those subject areas.

Typing skill is essential because reporters type their own news stories. Virtually all reporters now use computerized word processing equipment to write and edit stories, so jobseekers should be familiar with this type of equipment. The ability to take shorthand also is useful. Often, a knowledge of news photography is valuable.

The Dow Jones Newspaper Fund and individual newspapers and magazines as well as many radio and TV news organizations offer summer internships that provide college students with an opportunity to perform a variety of basic reporting or editing duties. Experience acquired through such internships helps immeasurably in job placement after graduation. In addition, more than 3,000 journalism scholarships, fellowships, and assistantships were awarded to college journalism students by universities, newspapers, foundations, and professional organizations in 1985.

News reporting involves a great deal of responsibility, because what a reporter writes frequently influences the opinion of the reading public. Reporters should be dedicated to serving the public's need for accurate and impartial news. Although reporters work as part of a team, they have an opportunity for self-expression. The ability to present facts and opinions clearly and succinctly is essential for success in this field. Accuracy and objectivity are equally important, because, among other reasons, untrue or libelous statements can lead to costly lawsuits.

Important personal characteristics include a "nose for news," curiosity, persistence, initiative, poise, resourcefulness, an accurate memory, and the physical stamina and emotional stability to deal with pressing deadlines, irregular hours, and sometimes dangerous assignments. Being at ease on camera or in front of a microphone is essential for broadcast reporters. Because some assignments lead reporters to unfamiliar places, they must be able to adapt to strange surroundings and feel at ease with a variety of people.

Some who compete for full-time reporter jobs find it is helpful to have had experience as a "stringer"—a part-time reporter who covers the news in a particular area of the community and is paid on the basis of the stories printed. High school and college newspapers and church or community newsletters also provide writing and editing experience that may be helpful in getting a job.

Most beginners start with small publications as general assignment reporters or copy editors. A few outstanding journalism graduates are hired by large city papers and national magazines, but this is the exception rather than the rule. Large employers generally require several years of reporting experience.

Beginning reporters are assigned duties such as reporting on civic and club meetings, summarizing speeches, writing obituaries, interviewing important visitors to the community, and covering police court proceedings. As they gain experience, they may report more important events, cover an assigned "beat," or specialize in a particular field.

Reporters may advance to reporting for larger papers or press services. However, competition for such positions is keen, and news executives receive many applications from highly qualified reporters every year. Some experienced reporters become columnists, correspondents, editorial writers, editors, or top executives; these positions represent the top of the field, and competition for them is extremely keen. Other reporters transfer to related fields such as public relations or preparing copy for radio and television news programs.

Job Outlook

Employment of reporters and correspondents is expected to grow about as fast as the average for all occupations through the mid-1990's. This growth will come about primarily because of an anticipated increase in the number of smalltown and suburban daily and weekly newspapers. For the most part, little or no increase is expected in the number of big city dailies, although some of them may increase the size of their reporting staffs. Magazines and radio and television broadcasting should continue to provide a significant number of jobs, but major news magazines and large radio and television stations primarily seek only experienced reporters. The need to replace experienced reporters and correspondents who leave the occupation each year will account for the vast majority of all job openings. Compared to other professional workers, a somewhat larger proportion of reporters and correspondents transfer to other occupations—reflecting the somewhat stressful and hectic nature of the job. Some people decide they don't like the lifestyle and transfer to other occupations where their skills are valuable, especially public relations and advertising work.

Overall, graduates who have majored in news-editorial journalism and completed an internship while in school should have the best prospects for reporting jobs. Most editors prefer to hire the top graduates of accredited programs. Talented writers who can handle highly specialized scientific or technical subjects will be at an advantage in the job market. Small newspapers often look for beginning reporters who are acquainted with the community and who can help with photography and other aspects of newspaper production. Persons without at least a bachelor's degree in journalism will face increasingly stiff competition for entry level positions.

Newspapers and magazines located in small towns and suburban areas are expected to continue to offer the most opportunities for beginning reporters. Journalism graduates who are willing to relocate and start at relatively low salaries are likely to find reporting jobs on these newspapers. Openings arise on small publications as reporters gain experience and move up to editorial positions, or transfer to reporting jobs on larger newspapers and magazines.

Competition for reporting jobs on large metropolitan newspapers and national magazines will be keen. Most of these employers require experience and do not ordinarily hire new graduates. Sometimes, however, new graduates find jobs on major publications because they have credentials in an area for which the paper has a pressing need. Occasionally, the experience and contacts gained through an internship program or summer job lead to a reporting job directly after graduation.

Because enrollments in journalism education programs are expected to continue rising moderately through the mid-1990's, college teaching opportunities are expected to be good for qualified applicants—generally, Ph.D.'s with practical reporting experience. Some highly qualified reporters with a master's degree will find teaching positions in journalism departments of colleges and junior colleges. This favorable outlook for journalism educators contrasts with the generally bleak prospect for college faculty in many other academic disciplines, because the student-teacher ratio in journalism courses is much lower than for many other college courses.

Employment of reporters and correspondents generally is not cut back sharply during slack economic periods, but when business conditions force publishers and broadcasters to reduce spending, new hiring may be temporarily slowed or even halted.

College graduates who have majored in journalism also have the background for work in such closely related fields as advertising and public relations. Every year, a substantial number of journalism graduates take media jobs in these fields. Other graduates accept sales, managerial, and other nonmedia positions, while still others continue their training and then find jobs in fields such as law, business, public administration, and political science.

Earnings

Weekly salaries of radio reporters ranged from $225 to $500 in 1984, according to a survey conducted by the National Association of Broadcasters. Salaries of TV reporters ranged from $290 to more than $1,000.

Reporters working for daily newspapers having contracts negotiated by the Newspaper Guild had starting salaries ranging from about $180 to over $800 a week in 1985. The majority started at between $300 and $450 a week.

Journeyman reporters averaged $540 a week in 1985, according to figures provided by the Newspaper Guild. Virtually all experienced reporters earned over $400 a week, while the top contractual salary was $843 a week. A number of top reporters on big city dailies earned even more, on the basis of merit. In general, earnings of reporters are above the average earnings of nonsupervisory workers in private industry, except farming.

Most reporters generally work a 5-day, 35- or 40-hour week and receive extra pay for overtime work. Benefits may vary widely according to length of service and the size and location of the employer. Most reporters, however, receive benefits such as paid vacations, group insurance, and pension plans.

Related Occupations

Reporters and correspondents must write clearly and effectively to succeed in their profession. Others for whom writing ability is essential include technical writers, advertising copy writers, public relations workers, educational writers, fiction writers, biographers, screen writers, and editors.

Sources of Additional Information

Career information, including pamphlets entitled *Your Future in Newspapers* and *Facts about Newspapers*, is available from:

American Newspaper Publishers Association Foundation, The Newspaper Center, Box 17407, Dulles International Airport, Washington, D.C. 20041.

Information on careers in journalism, colleges and universities that offer degree programs in journalism or communications, and journalism scholarships and internships may be obtained without charge from:

The Dow Jones Newspaper Fund, Inc., P.O. Box 300, Princeton, N.J. 08540.

For a list of junior and community colleges offering programs in journalism, contact:

National Community College Journalism Association, Midland College, Midland, Tex. 79701.

Information on union wage rates for newspaper and magazine reporters is available from:

The Newspaper Guild, Research and Information Department, 1125 15th St. NW., Washington, D.C. 20005.

For a list of schools with accredited programs in their journalism departments, send a stamped, self-addressed envelope to:

Accrediting Council on Education in Journalism and Mass Communications, University of Missouri, P.O. Box 838, Columbia, Mo. 65205.

For general information about careers in journalism, contact:

Association For Education in Journalism and Mass Communication, 1621 College St., University of South Carolina College of Journalism, Columbia, S.C. 29208.

Careers in Communications, a booklet providing information on opportunities for women in newspaper reporting and other communications fields, is available from:

Women In Communications, Inc., P.O. Box 9561, Austin, Tex. 78766.

A pamphlet titled *A Career in Newspapers* can be obtained from:

National Newspaper Association, 1627 K St. NW., Suite 400 Washington, D.C. 20006.

Names and locations of newspapers and a list of schools and departments of journalism are published in the *Editor and Publisher International Year Book*, available in most public libraries and newspaper offices.

Writers and Editors

(D.O.T. 131 except .267-010 and -018; and 132)

Nature of the Work

Writers and editors communicate through the written word. Writers develop original fiction and nonfiction prose for books, magazines, trade journals, newspapers, technical studies and reports, company newsletters, radio and television broadcasts, and advertisements. Editors supervise writers and select and prepare material for publication or broadcasting.

Writers start by selecting a topic or being assigned one by an editor. They then gather information on the topic through personal observation, library research, and interviews. Sometimes the information gathered may cause writers to change the focus to a related topic that is more interesting. From the information gathered, they select and organize the material to be used, and finally put it into words that will convey it to the reader with the desired effect. Writers often revise or rewrite sections, searching for the best organization of the material or just the right phrasing. Newswriters—writers employed by newspapers and radio and television news departments—write news items for inclusion in newspapers or news broadcasts. Starting with information supplied by reporters or wire services, they write news stories or scripts for newscasters. Reporters and correspondents are described elsewhere in this section of the *Handbook*.

Technical writers put scientific and technical information into readily understandable language. They prepare manuals, catalogs, parts lists, and instructional materials used by sales representatives to sell machinery or scientific equipment and by technicians to install, maintain, and service it.

Copy writers write advertising copy for use by publication or broadcast media to promote the sale of goods and services.

Established writers may work on a freelance basis where they sell their work to publishers or publication units, manufacturing firms, and public relations and advertising departments or agencies. They sometimes are hired to complete specific assignments such as writing about a new product or technique.

Editors frequently do some writing and almost always do much rewriting and editing, but their primary duties are to plan the contents of the publication and to supervise its preparation. They decide what will appeal to readers, assign topics to writers, and oversee the production of the book, magazine, or newspaper. In small organizations, one editor has full responsibility for the publication. In larger ones, an executive editor oversees the activities of associate or assistant editors who have responsibility for particular subjects, such as fiction, international news, or sports. Administrative duties of editors include hiring and firing writers and other employees, planning budgets, negotiating contracts with freelance writers, and general managerial duties. In broadcasting companies, program directors have responsibilities comparable to those of editors.

Editors and program directors are often helped by assistants who may have the title of assistant editor, editorial assistant, copy editor, or production assistant. Many of these assistants hold entry level jobs. They review copy for errors in grammar, punctuation, and spelling. They check manuscripts for readability, style, and agreement with editorial policy. They add and rearrange sentences to improve clarity or delete incorrect and unnecessary material. Researchers, research assistants, and some editorial assistants perform research for writers and verify facts, dates, and statistics. Assistants also may help prepare material for publication or broadcast by arranging page layouts of articles, photographs, and advertising or by planning the use of films. They may also compose headlines, prepare copy for typesetters, and proofread the printer's galleys. Some editorial assistants read and evaluate manuscripts submitted by freelance writers or answer letters about published or broadcast material. Production assistants clip stories that come over the wire services' printers, answer phones, and make copies of material for newswriters, editors, and program directors.

Working Conditions

Working conditions for writers and editors vary with the kind of publication they work on and the kind of articles they produce. Some work in comfortable, private offices; others work in noisy rooms filled with the sound of typewriters and other word processing equipment and other writers tracking down information over the telephone. The search for information sometimes requires travel and visits to diverse workplaces, such as factories, offices, laboratories, the ballpark, or the theater, but many have to be content with telephone interviews and the library.

Writers gather information through observation, research, and interviews.

The workweek usually runs 35 to 40 hours. Night and weekend work is required of those who prepare morning or weekend publications and broadcasts. Some workers must also put in overtime to meet deadlines or to cover a late-developing story. The more frequently the publication is issued, the more frequent the deadlines and the greater the pressure to meet them. The need to understand complex technical data may also be a source of stress or pressure.

Employment

Writers and editors held about 191,000 jobs in 1984. Nearly 40 percent of writers and editors work for newspapers, magazines, and book publishers. Substantial numbers also work on journals and newsletters published by business and nonprofit organizations, such as professional associations, labor unions, and religious organizations. Others write and edit advertising and public relations materials for advertising agencies, public relations firms, and large corporations. Some also work in radio and television broadcasting; others develop publications for Federal, State, and local governments.

Many technical writers work for firms manufacturing aircraft, chemicals, pharmaceuticals, and computer and other electronic equipment. Firms in the energy, communications, and computer software fields also employ many technical writers.

Persons who write and edit for major book publishers, magazines, broadcasting companies, advertising agencies and public relations firms, and the Federal Government tend to be concentrated in New York, Chicago, Los Angeles, Boston, Philadelphia, San Francisco, and Washington, D.C. More widely dispersed throughout the country, on the other hand, are those who work for newspapers; corporations; and professional, religious, business, technical, and trade union magazines or journals. Technical writers are employed throughout the country but the largest concentrations are in the Northeast, Texas, and California.

Thousands of other persons work as freelancers—earning some income from their articles, books, and, less commonly, television and movie scripts. Most support themselves primarily with income from other sources.

Training, Other Qualifications, and Advancement

Formal educational requirements for writing and editing jobs vary. A college degree is required by many employers, but there is little agreement as to the preferred major. Some employers look for a broad liberal arts background or a major in literature, history, philosophy, or one of the social sciences. Others prefer to hire people with degrees in communications or journalism.

Some jobs, such as technical writing, require a degree in or some knowledge about a specialized field—engineering, business, or one of the sciences. Relatively few technical writers enter the occupation directly from college. The majority work initially in other jobs, usually as technicians, scientists, or engineers. Some begin as research assistants, editorial assistants, or trainees in a company's technical information or advertising department. In time, these people may assume writing duties and develop technical communication skills.

Whatever their educational background, writers and editors must be able to express ideas clearly and logically. Creativity, intellectual curiosity, a broad range of knowledge, self-motivation, and perseverance are also valuable assets. For some jobs, the ability to concentrate amid confusion and to produce under pressure is essential. Familiarity with word processing equipment is useful, because a growing number of organizations are using the equipment for writing and editing. Since writing requires research, writers must be familiar with research techniques. Editors must have good judgment in deciding what material to accept and what to reject. They must also have tact and the ability to guide and encourage others in their work.

All prospective writers need practical writing experience. High school and college newspapers, literary magazines, and small community newspapers and radio stations all provide valuable—but sometimes unpaid—experience. Many magazines, newspapers, and radio and TV stations have summer internships in which students can learn about the publishing and broadcasting business. Interns might run errands, answer phones, conduct some research and interviews, or even write short pieces, depending on the employer.

Advancement for writers and editors depends, in part, on the size of the organization for which they work. In small firms, beginning writers and editors may do a little bit of everything, not only working as editorial or production assistants but also writing or editing material right away. They often advance by moving to other firms, so turnover among beginning writers and editors is high. In larger firms, jobs are usually structured more formally. Persons in entry level positions generally do research, fact checking, or copy editing. They take on full-scale writing or editing duties less rapidly than do the employees of small companies. Advancement comes as they are assigned more important articles to write or edit.

Job Outlook

Employment of writers and editors is expected to increase faster than the average for all occupations through the mid-1990's. Employment of salaried writers and editors by newspapers, periodicals, book publishers, and nonprofit organizations—including research agencies and religious, business, professional, and civic associations—is expected to increase with growing demand for their publications. Growth of advertising and public relations agencies should also be a source of new jobs. Demand for technical writers is expected to increase because of the continuing expansion of scientific and technical information and the continued need to communicate it to researchers, corporate managers, sales representatives, and technicians. With the increasing complexity of industrial and scientific equipment, more users will depend on the technical writer's ability to prepare precise but simple explanations and instructions. Besides jobs created by increased demand for writers and editors, many job openings will occur as experienced workers in this field transfer to other occupations or leave the labor force.

Each year, thousands of young people with college degrees in English, journalism, communications, and the liberal arts seek writing and editing jobs. Many end up in other occupations because the number of people qualified to work as writers and editors greatly exceeds the number of positions available, despite the high turnover in these occupations. Throughout the mid-1990's, the outlook for writing and editing jobs is expected to continue to be keenly competitive. Opportunities will be best in firms that prepare business and trade publications and in technical writing. Persons considering careers in writing and editing should keep their options open. Academic preparation in a field unrelated to writing may prove useful to some people, either to qualify them as writers specializing in that field, or to qualify them for a job in the field itself in the event that they are unable to get a salaried writing job.

Earnings

In 1984, beginning salaries for writers and editorial assistants ranged from $16,400 to $21,000 annually, according to surveys by the Executive Compensation Service. Salaries for experienced writers and researchers generally ranged between $23,200 and $31,900 a year, depending on their qualifications and the size of the publication on which they worked. Technical writers had salaries ranging from $19,300 to $31,900. Experienced editors generally earned between $22,000 and $39,000 a year; supervisory editors, $25,300 to $42,500 a year.

Starting salaries for copy editors on daily papers in towns with a population of less than 20,000 averaged $9,700 in 1984; copy editors in cities of 500,000 or more earned $13,000, according to a survey by the Dow Jones Newspaper Fund. Senior editors on large circulation newspapers and magazines, however, averaged over $60,000 per year. In addition, many writers and editors supplement their salaried income by doing freelance work.

Writers and editors employed by the Federal Government earned an average of $28,000 a year in 1984.

Related Occupations

Writers and editors communicate ideas and information to individuals for their education and entertainment. Other communications occupations include newspaper reporters and correspondents, radio and television announcers, advertising and public relations workers, and teachers of journalism.

Sources of Additional Information

For information on writing and editing careers in the field of communications, contact:

Women in Communications, Inc., P.O. Box 9561, Austin, Tex. 78766.

For a guide to journalism careers and scholarships, contact:

The Dow Jones Newspaper Fund, P.O. Box 300, Princeton, N.J. 08540.

For information on college internships in magazine editing, contact:

American Society of Magazine Editors, 575 Lexington Ave., New York, N.Y. 10022.

For information on careers in technical writing, contact:

Society for Technical Communication, Inc., 815 15th St. NW., Suite 516, Washington, D.C. 20005.

For information on careers in business communication, contact:

The Association for Business Communications, 100 English Building, 608 South Wright St., Urbana, Ill. 61801.

Visual Arts Occupations

The visual arts occupations include both fine and applied artists. Fine artists create objects of beauty that are appreciated for purely aesthetic reasons. Applied artists create or design objects that are both practical and attractive.

Applied artists design clothing, automobiles, appliances, and other products, arrange flowers, draw cartoons, illustrate publications, and compose and take photographs. Manufacturers, retail and wholesale trade establishments, advertising agencies, printing and publishing firms, theatrical producers, and television and motion picture studios employ most applied artists. In addition, some are self-employed, doing contract work for these organizations.

Fine artists, on the other hand, are more dependent on the general public for their livelihood. Although some well-established artists support themselves exclusively by sales of their work, most fine artists supplement their income with earnings from another job.

Visual arts occupations cover a wide variety of specialties. For example, sculptors create three-dimensional works from stone, concrete, plaster, wood, metal, and other materials. Painters use watercolors, oils, and acrylics to paint portraits, landscapes, still lifes, and other subjects. Printmakers produce images in paper and cloth from designs etched in wood, metal, and stone. Graphic artists design newspaper and TV advertisements as well as catalogs, books, and instructional materials; photographers and camera operators take or record pictures to convey an idea or tell a story; industrial designers develop functional, attractive articles and packages for everyday use; set designers design movie, television, and theater sets. Fashion designers design clothes, fabrics, and accessories; and floral designers create floral arrangements to express the thought and sentiments of the sender.

Artistic talent is crucial in all visual arts occupations. People in this field need strong color sense, an eye for detail, a sense of balance and proportion, and sensitivity to beauty. They must be creative, imaginative, persistent, and able to communicate visually and verbally. A good portfolio—a collection of examples of a designer's best work—is sometimes more important in finding a job than formal education.

Although artistic talent remains the major qualification, technical skills are becoming more important. For example, industrial designers increasingly use computer-aided design to create new products or to improve existing ones. In addition, illustrators develop computer-generated images for television broadcasting.

Design careers require varying levels of training. While floral designers often learn their skills on the job and may not even need a high school diploma, industrial designers as a rule must complete 4 or more years of college. Persons with appropriate work experience and a major in engineering, architecture, and fine arts may also gain entry to this field. A liberal arts education and training in painting, sculpture, and architecture are important for graphic and fine artists. Fashion designers get their training in 2- or 3-year programs in schools of fashion design or in 4-year colleges leading to a bachelor's degree in fashion design. The curriculum for these occupations includes principles of design, art and art history, mechanical and architectural drawing, painting, architecture, and basic engineering. Although a college degree is not necessary for photographers and camera operators, 2-year and 4-year institutions offer courses or degree programs in photography and cinematography.

Creative work can be frustrating, even discouraging, during periods when new ideas don't come—or when the designer's ideas clash with those of a client or boss. Tact, problem-solving skills, the ability to work independently as well as with others, and sound professional judgment are important traits for individuals in this field.

The statements that follow discuss design occupations in more detail. Workers in several other occupations that require design skills—urban and regional planners, engineers, and architects—are discussed elsewhere in the *Handbook*.

Designers

(D.O.T. 141.031, .051, .061-018, .067, .081-014; and 142 except .061-030)

Nature of the Work

Designers arrange and design articles, products, and materials in such a way that they are not only functional, serving the purpose for which they were intended, but also visually pleasing. Products and packaging that are both functional and eye catching are more likely to attract buyers than those that are not. Pleasant surroundings, beautiful clothes, and floral arrangements can boost our spirits.

Designers usually specialize in one type of product or activity, for example, automobiles, clothing, furniture, home appliances, industrial equipment, movie and theater sets, packaging, or floral arrangements. In developing a new design or altering an existing one, they first determine the needs of their clients and potential users. Then they consider the size, shape, weight, color, materials used, and the way the product functions, as well as ease of maintenance, safety, and cost of the design. Designers may compare similar or competitive products. They take into account and often set style and fashion trends. Designers usually develop sketches of several designs which they present for final selection to an art or design director; a product development team; a play, film, or television producer; or a client. The designer then makes a model, a sample, or scaled detailed plans and drawings. Designers may also supervise craft workers who carry out their designs. Those with their own businesses also must find clients and do administrative work.

The design field includes a variety of specialties. *Industrial designers* develop and design countless manufactured products like cars, home appliances, computers, stethoscopes, filing cabinets, fishing rods, pens, and piggy banks. They combine artistic talent with research on product use, marketing, materials, and production methods to create the best and most appealing design and to make the product competitive with similar ones in the marketplace. *Package designers* create product containers that are not only attractive but easy to handle and store. *Graphic designers* draw or paint illustrations to advertise a product or an event. They also draw or design commercial logos such as corporate symbols or letterheads.

Set designers design movie, television, and theater sets. They study scripts, confer with directors, and conduct research to determine appropriate architectural styles.

Fashion designers design coats, suits, dresses, hats, handbags, shoes, gloves, jewelry, underwear, and other apparel. Some high-fashion designers are self-employed and design for individual clients. They make fashion news by establishing the "line," colors, and kinds of materials that will be worn each season. Other high-fashion designers cater to specialty stores or high-fashion department stores. They design original garments as well as follow the established fashion trends. Designers who work for apparel manufacturers do less original work; they adapt for the mass market the fashions set by other designers.

Cloth designers design fabrics for garments, upholstery, rugs, and other products, utilizing their knowledge of textile materials and fashion trends.

Floral designers cut and arrange fresh, dried, or artificial flowers and foliage into a design to express the sentiments of the sender. They trim flowers and arrange bouquets, sprays, wreaths, dish gardens, and terrariums. They usually work from a written order indicating the occasion, customer preference for color and type of flower, price, and the date, time, and place the arrangement or plant is to be delivered. The variety of duties performed by a floral designer depends on the size of the shop and the number of designers employed. In a small operation, the floral designer may own the shop and do almost everything from growing flowers to keeping books.

Art directors and *layout artists* produce the artwork for advertising campaigns.

Working Conditions

Working conditions and places of employment vary, depending on the specialty. Designers employed by manufacturing establishments or design firms generally work regular hours in well-lighted and comfortable settings. Those who are self-employed usually work longer hours and have a lot of paperwork connected with running their business.

Designers frequently must adjust their workday to suit their clients, meeting with them evenings or on weekends when necessary. They may transact business in clients' homes or offices, in their own offices, or in other locations such as decorator showrooms. Industrial designers usually work regular hours and only occasionally work overtime to meet deadlines. In contrast, set designers, especially those in television broadcasting, often work long and irregular hours. Television production tempo is very fast and the set designers are often under pressure to make rapid changes in the sets. Fashion designers who work in the apparel industry usually have regular hours; however, their work may be seasonal and require long hours before fashion showings. Floral designers usually work regular hours in a pleasant work environment, except during the holidays when overtime may be required. All designers face frustration at times when their designs are rejected or when they cannot be as creative as they would like. Independent consultants, who are paid by the assignment, are under pressure to please clients and to find new ones to maintain their incomes.

Employment

Designers held about 205,000 jobs in 1984. More than two-fifths were in wholesale and retail trade—in florist shops, furniture and home furnishings stores, department stores, and apparel stores. About one-fourth were in manufacturing industries—primarily machinery, motor vehicles and aircraft, apparel, metal products, instruments, printing and publishing, and textiles. Service industries, primarily business services and engineering and architectural firms, accounted for about 2 out of 10 jobs. Construction firms and government agencies also employed some designers. Self-employed designers accounted for about one-fourth of all jobs.

Nearly all floral designers work in retail flower shops. Many florist shops are small and employ only a few designers. Many floral designers manage their own shops. Most industrial designers work for consulting firms or large manufacturing companies. Some work for architectural firms or do freelance work. Fashion designers work in the apparel industry, privately owned salons, high-fashion department stores, and specialty shops. Some work for pattern manufacturers or as freelancers. Some fashion de-

Floral designers are especially busy during holidays.

signers work in the entertainment industry designing costumes for theater, television, and movies. Set designers usually work for theater companies, the film industry, and television broadcasting.

Training, Other Qualifications, and Advancement

Creativity is crucial in all design occupations. People in this field also need a strong color sense, an eye for detail, a sense of balance and proportion, and sensitivity to beauty. A good portfolio—a collection of examples of a person's best work—is sometimes more important in finding a job than formal education. However, formal training and technical skills are becoming increasingly important. Almost 2 out of 3 designers entering the field in 1983 had a college degree or some college education. Some design occupations such as industrial designers require 4 or more years of college. Computer-aided design is increasingly being utilized in industrial and textile design. Many employers require new employees to have these technical skills. Schools that incorporate this type of technical training into their academic curriculum find it easier to place their graduates.

Formal training is available in 2- and 3-year professional schools which award certificates or associate degrees in design. Four-year colleges and universities grant the degree of Bachelor of Fine Arts. The curriculum in these schools includes art and art history, principles of design, fashion designing and sketching, garment construction, textiles, mechanical and architectural drawing, computerized design, sculpture, architecture, and basic engineering. A liberal arts education with courses in merchandising and business administration along with training in art is also a good background. Persons with training or experience in architecture also qualify for some design occupations.

In 1985, the National Association of Schools of Art and Design accredited 133 colleges and schools with programs in art and design. Eighteen of these schools offer programs in industrial design that are listed by the Industrial Designers Society of America. Most of these schools award a degree in art, industrial design, textile design, graphic design, or fashion design. Many schools do not allow formal entry into a bachelor's degree program until a student has successfully finished a year of basic art and design courses. Applicants may be required to submit sketches and other examples of their artistic ability. Some colleges and universities offer degrees in floriculture and floristry and provide training in flower marketing and shop management. Junior colleges, adult education programs, and correspondence schools also offer courses in design. Floral designers may also get training in commercial floral design schools.

Regardless of the amount of formal training required, people in the design field must be creative, imaginative, persistent, and able to communicate their ideas visually. Because tastes in style and fashion can change quickly, designers need to be open to new ideas and influences. Problem-solving skills and the ability to work independently are important traits. People in this field need self-discipline to start projects on their own, and to budget their time in order to meet deadlines. Business sense and sales ability are important for those who are freelancers or run their own businesses.

Beginning designers are usually given on-the-job training. Usually a person can become a qualified floral designer after 2 years of on-the-job training; beginners in industrial design usually need 1 to 3 years of training before they advance to higher level positions. Experienced designers may advance to chief designer, design department head, or other supervisory positions. Some experienced designers open their own firms.

Although most States have no licensing requirements in the field, membership in a professional association is a recognized mark of achievement for many designers. Membership usually requires the completion of 3 or 4 years of postsecondary school education in design and at least 2 years of practical experience in the field.

Job Outlook

Employment in design occupations is expected to grow faster than the average for all occupations through the mid-1990's. However, most of the openings will result from the need to replace those who leave. Designers tend to leave their field at a somewhat higher rate than other professional and technical workers. Most who leave transfer to other occupations; others assume household responsibilities or retire.

Despite projected faster than average employment growth, persons seeking beginning jobs in most design fields, with the exception of floral design, are expected to face stiff competition. Many talented individuals are attracted to design work, and those with only average talent or without formal education and technical skills are likely to find it difficult to find jobs.

Continued emphasis on product quality and safety, on design of new products for businesses and offices, and on high-technology products in medicine and transportation should expand the demand for industrial designers. Growth in population and in personal incomes should increase the demand for fashion designers, floral designers, and set designers.

Earnings

Median annual earnings of experienced full-time designers were almost $21,900 in 1984. The middle 50 percent earned betwen $14,800 and $32,500 a year. The bottom 10 percent earned less than $10,500, and the top 10 percent earned more than $40,500. Floral designers generally earned somewhat less than the median. Earnings of self-employed designers varied greatly, depending on their talent and business ability, but generally were higher than those of salaried designers.

Related Occupations

Workers in other occupations who design or arrange objects, materials, or interiors to improve their appearance and function include architects, engineers, photographers, merchandise displayers, fur designers, graphic designers, commercial artists, and fine artists.

Sources of Additional Information

For information about careers in floral arrangement, contact:

Society of American Florists, 901 North Washington St., Alexandria, Va. 22314.

A brochure about careers and a list of schools offering courses and degrees in industrial design are available for $2 from:

Industrial Designers Society of America, 1360 Beverly Road, Suite 303, McLean, Va. 22101.

For information about careers in apparel design, contact:

International Association of Clothing Designers, 450 Seventh Avenue, Suite 811, New York, N.Y. 10123.

Graphic and Fine Artists

(D.O.T. 102.261-014; 141.061-010, -014, -022, -26, -030; .081-010; 144; and 149.041, and .261)

Nature of the Work

Fine artists include painters, sculptors, and printmakers who produce works of art for their own pleasure and for display in museums, art galleries, and homes. *Painters* use a wide variety of substances, including watercolors, oils, and acrylics to paint their interpretations of objects, people, and nature. *Sculptors* design three-dimensional art works from stone, concrete, plaster, metal, or wood. *Printmakers* create printed images from designs etched in stone, metal or wood. A large proportion of artists, however, are graphic artists who illustrate and design the flood of magazine, newspaper, and TV advertisements as well as catalogs, brochures, instruction manuals, technical literature, book and record jackets, textiles, and many other items requiring visual appeal.

The field of graphic art, also called commercial art or design, is very broad and includes some activities only loosely related to what is usually thought of as art. Most people in the field work in either illustration or design. *Editorial artists* specialize in illustrations for magazines, record album covers, theater posters, and other publications. This specialty is perhaps the most glamorous and "artistic" commercial art specialty.

Illustrators paint or draw pictures for books, magazines, and film. Many do a variety of illustrations, while others specialize in a particular field. For example, *medical* and *scientific illustrators* combine an interest in art with knowledge of the biological and physical sciences. They draw illustrations of parts of the human body, or animals and plants. These illustrations are used in medical textbooks and in slide presentations for teaching purposes. *Fashion illustrators* draw stylish illustrations of the latest fashions in women's and men's clothing.

Some illustrators draw "story boards" for TV commercials. Story boards present TV commercials in a series of scenes in much the same way as a newspaper comic strip tells a story, so that the advertising agency and the client (the company doing the advertising) can evaluate the effectiveness of proposed commercials. Story boards may also serve as guides to placement of actors and cameras and to other details during the production of commercials. Some illustrators draw for children's books; others specialize in book and record jacket illustration, posters, and magazine advertisements.

Cartoonists form another illustration specialty. They draw political cartoons, newspaper comic strips, and comic books. Some cartoonists work with others who create the idea or story and write the captions. Most cartoonists, however, must have humorous, critical, or dramatic talents in addition to drawing skills.

Animators draw the large series of pictures which, when transferred to film, form the animated cartoons seen in movies and on TV. Animators are employed almost exclusively in the motion picture industry, which produces animated cartoons for TV and movies.

Working Conditions

Many graphic artists are salaried employees who work in offices and studios. Their working conditions are similar to those of other office workers.

Many graphic artists, especially illustrators, are freelancers who do individual projects for those wishing to use their services. Until an illustrator develops a reputation and a regular clientele, he or she can't count on a steady income. Much effort often must be expended on selling potential customers on the quality of one's work and to acquire experience and a reputation. Freelancers can set their own hours and working conditions. However, both freelance and salaried graphic artists must frequently meet tight deadlines which necessitate long hours of work until the project is complete.

Fine artists generally are self-employed, earning income only when they sell a painting or other work. This is a very competitive field in which most people fail to support themselves solely though sales of their art. Consequently, many fine artists must hold down another job in order to make ends meet. Most teach in a college, university, or art school for an income. Often they are expected to exhibit their work in major shows.

Employment

Graphic and fine artists held about 204,000 jobs in 1984. Many graphic artists are employed by the advertising industry, either directly or indirectly as freelancers, or by graphic art studios that do much of their work for advertising agencies. The publishing industry also employs many graphic artists. In addition, organizations such as department stores and other retailers, durable goods manufacturing firms, motion picture producers, and government agencies employ graphic

Illustrators do precision work, requiring close attention to detail.

artists for in-house advertising, graphic arts, and related activities.

Graphic artists are concentrated in large cities. New York City has by far the largest concentration because it is the center of both advertising and publishing. Boston, Chicago, Los Angeles, and San Francisco also have many artists.

Training, Other Qualifications, and Advancement

In the graphic arts field, demonstrated ability and appropriate training or other qualifications are needed for success. The device used by almost all in the graphic arts field to gain employment or freelance work is the "portfolio," a collection of examples of the artist's best work. Evidence of appropriate talent and flair shown in the portfolio is the most important factor used by art directors and others in deciding whether to hire or contract out work to an artist. In theory, a person with a good portfolio but no training or experience could succeed in graphic arts. In reality, assembling a successful portfolio requires skills generally developed in a postsecondary art school—usually in a 4-year program. Generally, a commercial artist is better prepared for a successful career if he or she has such specialized training. For some fields such as scientific and medical illustration, highly specialized training is absolutely essential. A bachelor's degree in fine arts is less useful because it is focused more on art for its own sake than on art for marketing and other purposes. There are many kinds of art schools, some with 2-year associate degree programs, as well as vocational education programs. Some of these provide the technical skills necessary to get an entry level job but may not give the background necessary for advancement.

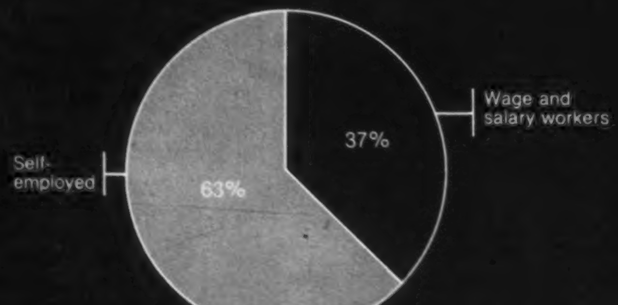
Persons hired in advertising agencies or graphic arts studios often start with relatively routine work such as paste-ups or mechanicals. While doing this work, however, they may observe and practice their skills on the side. Those with talent may advance to assistant art director and then to art director. Others may gain enough skill to succeed as a freelancer or may prefer to specialize in an area such as calligraphy. Many freelancers get started by working part time as a freelancer while continuing to hold a full-time job. Others have enough talent and confidence in their ability to start out as a freelancer immediately after they graduate from art school. Many actually freelance part time while still in school, an excellent way to develop experience and a portfolio of published work.

The freelancer develops a set of clients who regularly contract for work at good rates. Some successful freelancers are widely recognized for their skill in specialties such as children's book illustration or editorial illustration. These freelancers earn high incomes and can pick and choose the type of work they will do.

Fine artists and illustrators advance as their work circulates and as they establish a reputation for a particular style. The best artists and illustrators continue to grow in ideas, and their work constantly changes and evolves over time.

More than 3 out of 5 graphic and fine artists are self-employed.

Distribution of employment, 1984



SOURCE: Bureau of Labor Statistics

Job Outlook

The graphic and fine art field has a glamorous and exciting image. Because formal entry qualifications are few, many people at least partially qualify for entry. Consequently, competition is keen for salaried jobs and freelance work. Many artists find only enough freelance work to occupy them part time and must have another job in order to support themselves. Many freelancers have to charge very low prices until they acquire experience and a good reputation. Despite an oversupply of those seeking graphic art jobs, those with outstanding talent are eagerly sought.

Employment of graphic artists is expected to grow faster than the average for all occupations through the mid-1990's as advertising and design continue to expand with the economy and as producers of information, goods, and services stress visual appeal. Many new jobs will be created in advertising agencies and graphic art studios. The demand for fine artists will remain about the same even as the population expands and incomes rise. However, undoubtedly the supply of those seeking entry to this field will continue to exceed requirements. Those with above-average talent and a mastery of graphic art skills will continue to be in demand.

Earnings

The median earnings for salaried graphic artists who usually work full time were about $18,600 a year in 1984. The middle 50 percent earned between $13,000 and $26,000 a year.

Earnings for freelancers—particularly those in the fine arts field—vary widely. Those struggling to gain experience and a reputation may sometimes be forced to charge what amounts to less than the minimum wage for their work. Well-established freelancers are able to make a very comfortable living. Freelancers of course do not receive any of the usual fringe benefits such as health insurance or retirement benefits that salaried employees receive.

Related Occupations

Many occupations in the advertising industry, such as account executive or creative director, are closely related to commercial and graphic art and design. Workers in other occupations which apply visual art skills are architects, display workers, floral designers, industrial designers, interior designers, landscape architects, and photographers. The various printing occupations are related to graphic art, as are teachers of art and design.

Sources of Additional Information

For additional information on graphic artists, write to:

The Graphic Artists Guild, 30 East 20th St., Room 405, New York, N.Y. 10003.

The National Art Education Association, 1916 Association Dr., Reston, Va. 22091.

The American Institute of Visual Arts, 1059 3rd Ave., New York, N.Y. 10021.

Photographers and Camera Operators

(D.O.T. 143.)

Nature of the Work

Photographers and camera operators use their cameras and film to portray people, places, and events much as a writer uses words. Because the procedures involved in still photography are quite different from those used in news and motion picture photography, workers generally specialize in one or the other. Those who are skillful can capture the personality of individuals or the mood of scenes on film. Photographers specializing in scientific, medical, or engineering photography expose worlds normally hidden from our view. Camera operators film news events, television shows, movies, commercials and even cartoons.

Although their subject matter varies widely, many photographers and camera operators use the same basic equipment. The most important tool remains the camera. Some camera operators use 35mm cameras to film motion pictures, 16mm cameras to film documentary and industrial films, and videotape cameras to record news events for later showing on television. Most other photographers use a wide variety of cameras to achieve desired results. Unlike snapshot cameras, which have a lens permanently attached to the camera body, the professionals' cameras are generally constructed to use a variety of lenses designed for close-up, medium-range, or distance photography. In addition, professional photographers and camera operators use a vast array of mechanical equipment—from the simple tripod to specially constructed motorized vehicles.

Besides cameras and lenses, photographers and camera operators use a variety of film and colored filters to obtain the desired effect under different lighting conditions. When taking pictures indoors or after dark, they may use electronic flash units, floodlights, reflectors, and other special lighting equipment.

Some photographers develop and print their own photographs in the darkroom and may enlarge or otherwise alter the basic image. Many photographers send their work to laboratories for processing. (See the statement on photographic workers elsewhere in the *Handbook*.)

In addition to the skilled use of cameras and accessories, photographers must be able to compose their pictures with creativity and style.

Still photographers may specialize in a particular type of photography, such as portrait, fashion, or advertising. Portrait photographers take pictures of individuals or groups of persons and often work in their own studios. For special events, such as weddings or christenings, however, they take photographs in churches and homes. Portrait photographers in small studios, like other small business owners, frequently handle all aspects of their business. They arrange for advertising and schedule appointments; set and adjust equipment before taking the pictures; develop and retouch negatives; develop proofs; and mount and frame pictures. They also purchase supplies and take care of billing and recordkeeping.

Advertising or industrial photographers take pictures of a wide range of subjects including livestock, manufactured articles, buildings, and groups of people. They frequently do photography for catalogs. Companies use their work in publications to report to stockholders or to advertise company products or services. To create attractive, eye-catching promotional pictures, advertising photographers must command a broad array of photographic techniques. Industrial photographers also photograph groups of people for employee news magazines or take motion pictures of workers operating equipment and machinery for management's use in analyzing production or work methods.

Scientific photographers and biological photographers provide illustrations and documentation for scientific publications and research reports. The photographs and slides they produce are also used for teaching purposes. These photographers usually specialize in a particular field, such as engineering, aerodynamics, medicine, biology, or chemistry. Some design photographic equipment for use as a research tool. For example, medical researchers often use ultraviolet and infrared photography, fluorescence, and X-rays to obtain information not visible under normal conditions. Time-lapse photography (where time is stretched or condensed), photomicrography (where the subject of the photography may be magnified 50 or 70 times or more), and photogrammetry (surveying an area using aerial photography) are other special techniques.

Photojournalists photograph newsworthy events, places, people, and things for publications such as newspapers and magazines. They may also prepare educational slides, filmstrips, and movies.

Some camera operators work for television networks and individual stations, covering news events as part of a team that includes a reporter and other technicians. These camera operators use special photographic equipment—called electronic news gathering cameras—to capture events on videotape. Images from these cameras can be transmitted via satellite from the news scene back to the newsroom in time for the news telecast.

Camera operators also are employed in the entertainment field. They use 35mm and 16mm motion picture cameras to film movies, television programs, and commercials. Animation camera operators film cartoons; optical-effects camera operators create illusions for television and movies. Camera operators in the entertainment business are usually supervised by directors of photography.

Working Conditions

Working conditions for photographers and camera operators vary consider-

To get a perfect shot, precise adjustments must be made.

ably. Photographers in government, commercial studios, and advertising agencies usually work a 5-day, 35- to 40-hour week. Freelancers, newspaper photographers, and camera operators may work longer or more irregular hours. Many photographers work part time.

Freelance, press, and commercial photographers may travel frequently and may work in uncomfortable surroundings. Sometimes the work can be dangerous, especially for photojournalists assigned to cover stories on natural disasters or military conflicts. When working on assignment or on location, photographers and camera operators may be away from home for long periods.

Most photographers and camera operators work under pressure. Deadlines and demanding customers must be satisfied. Freelance photographers may find soliciting new clients frustrating and tedious.

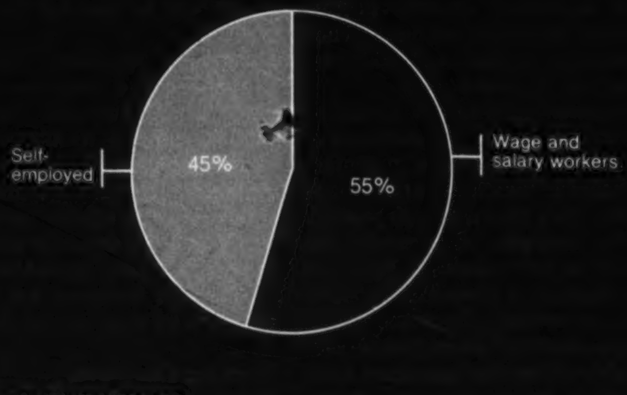
Employment

Photographers and camera operators held about 101,000 jobs in 1984. About half of all jobs are salaried positions. The rest are held by self-employed photographers who do individual projects for those wishing to use their services. Photographic or commercial art studios provide the most jobs; other employers include newspapers, magazines, radio and television broadcasters, motion picture companies, government agencies, and manufacturing firms. Some photographers were employed by colleges, universities, and other educational institutions to prepare promotional and educational materials. Camera operators are employed primarily in television broadcasting and motion picture studios.

Jobs for photographers are found in all parts of the country—both small towns and large cities—but are concentrated in the more populated areas. Almost all camera operators are employed in metropolitan areas, but assignments may take them far away from home.

Almost half of all photographers and camera operators are self-employed.

Distribution of employment, 1984



Source: Bureau of Labor Statistics

Training, Other Qualifications, and Advancement

Although a high school education is desirable, entry level jobs for photographers have no formal education or training requirements. Employers usually seek applicants who have a broad technical understanding of photography as well as other photographic talents, such as imagination, creativity, and a good sense of timing. Technical expertise can be obtained through practical experience, postsecondary training, or some combination of the two. Some jobs do require that applicants have specialized knowledge of the subject areas that will be photographed.

Photographic training is available in colleges, universities, junior colleges, public vocational education programs, and private photography and art schools. Over 100 colleges and universities offered 4-year curriculums leading to a bachelor's degree in photography in 1984. Many of these schools offer courses in cinematography. However, very few schools offer a degree in cinematography. Many schools offer photography courses as part of their communications and journalism programs. Some colleges and universities grant master's degrees in photography. In addition, some colleges have 2-year curriculums leading to a certificate or an associate degree in photography. A formal education in photography gives a fundamental background in a variety of equipment, processes, and techniques. Art schools offer useful training in design and composition, but not the technical training needed for professional photographic work. The Armed Forces also train people in photographic skills.

On-the-job training is an important source of training for both camera operators and photographers. Because academic programs are not oriented toward motion picture photography, informal job training is often the only way camera operators can acquire the necessary skills. Trainees begin as first and second assistants to camera operators, helping set up equipment and learning the craft by observing experienced workers.

People may prepare for work as photographers in a commercial studio through 2 or 3 years of on-the-job training as a photographer's assistant. Trainees generally start in the darkroom where they learn to mix chemicals, develop film, and do photoprinting and enlarging. Later they may set up lights and cameras or help an experienced photographer take pictures.

Amateur experience is helpful in getting an entry job with a commercial studio, but post-high school education and training usually are needed for industrial or scientific photography. Here success in photography depends on being more than just a competent photographer, and adequate career preparation requires some knowledge of the field in which the photography is used.

Photographers and camera operators must have good eyesight and color vision, artistic ability, and manual dexterity. They should be patient, accurate, and enjoy working with detail. Some knowledge of mathematics, physics, and chemistry is helpful for understanding the use of various lenses, films, light sources, and development processes.

Some photographic specialties require additional qualities. Commercial or freelance photographers must be imaginative and original in their thinking. Those who specialize in photographing news stories must recognize a potentially good photograph and act quickly; otherwise, an opportunity to capture an important event on film may be lost. Writing ability sometimes is important for photojournalists, who may write captions and accompanying articles for their photographs. Portrait photographers need the ability to help people relax in the presence of the camera.

Newly hired workers are given relatively routine assignments that do not require split-second camera adjustments or decisions on what subject matter to photograph. News photographers, for example, may be assigned to cover events such as civic meetings or snowstorms. After gaining experience, they advance to more demanding assignments, and may move to larger newspapers or magazines. A few gain national recognition for their work and exhibit their photographs in art and photographic galleries, or publish them in books. Camera operators—like news photographers—advance in their profession as their work circulates and as they develop a reputation. The best known camera operators may become directors of photography on movies and TV programs. A few industrial or scientific photographers may be promoted to supervisory positions. Magazine and news photographers may eventually become heads of graphic arts departments or photography editors.

Job Outlook

Employment of photographers and camera operators is expected to grow faster than the average for all occupations through the mid-1990's. In addition to openings resulting from increased demand for photographers, others will occur each year as workers transfer to other occupations or leave the labor force.

Demand for photographers will be stimulated as business and industry place greater importance upon visual aids in meetings, stockholders' reports, sales campaigns, and public relations work. Photography is becoming increasingly important in scientific and medical research, where opportunities are expected to be good for those with appropriate technical skills. Employment in photojournalism is expected to grow slowly.

Although employment of camera operators is expected to grow rapidly as entertainment industries expand, competition for jobs is expected to remain keen. This is considered an exciting and glamorous field and it attracts many more applicants than there are jobs.

Earnings

Photographers and camera operators in private industry who did relatively routine work averaged $17,400 a year in early 1984; those at midlevel averaged between $21,800 and $26,000; and those doing difficult work, $28,800. In general, camera operators earned more than photographers.

In early 1985, beginning photographers who worked for newspapers that have contracts with the Newspaper Guild had weekly earnings between $180 and $856; the majority earned between $285 and $400. Earnings of newspaper photographers with some experience (usually 4 or 5 years) ranged between $280 and $885 a week in early 1985. Most experienced photographers earned between $510 and $640 a week.

Photographers in the Federal Government earned an average of $23,600 a year in 1985.

Some self-employed and freelance photographers earn more than salaried workers. Many self-employed photographers, however, earn very little from their photography work. Earnings of freelancers are affected greatly by general business conditions and the type and size of their community and clientele.

Related Occupations

Other workers who rely on their visual arts talents in their jobs include graphic and fine artists, floral designers, illustrators, industrial designers, painters, and sculptors.

Sources of Additional Information

Career information on photography is available from:

Professional Photographers of America, Inc., 1090 Executive Way, Des Plaines, Ill. 60018.

American Society of Magazine Photographers, 205 Lexington Avenue, New York, N.Y. 10016.

Performing Arts Occupations

The performing arts include acting, dancing, instrumental music, and singing. These fields have the common goals of entertaining, communicating with, and affecting the emotions of audiences. A performer's work depends entirely upon his or her personal qualities—such as speech, appearance, facility in body movement, finger dexterity, and mental capacities. Performing arts occupations also include choreographers, composers, and directors, who create or interpret works of art or rehearse and instruct performers, and producers who plan and coordinate shows and performances.

The excitement of opening night, the thrill of an audience's applause, the love of one's art, and the opportunity for creative self-expression are some inducements for people to enter the performing arts. Most aspiring artists spend many years in intensive training and practice before they are ready for professional performances. They not only need talent but also determination, a willingness to work long and hard in their chosen field, and some luck.

Within the performing arts, the number of talented persons seeking employment generally exceeds by far the number of positions available. As a result, many performers are not able to find enough work in their field to be employed full time all year long. Many supplement their incomes by teaching or by working much of the time in occupations unrelated to the performing arts. Only the most successful performers can earn a living solely from their art; therefore, persons interested in these careers may wish to consider training for a backup or alternative field of work.

The statements that follow give detailed information on actors, directors and producers, dancers and choreographers, and musicians.

Actors, Directors, and Producers

(D.O.T. 150 except .027-014; 159.067-010, 014, .117-010, .167-014, -018, .267-010, and .647-014; 184.117-010, .167-014, -022, -030, -034, and -074; 187.167-174, -178, -182; 961.364-010; 962.167-014)

Nature of the Work

Actors, directors, and producers work in theater, film, television, and radio. Actors play parts to entertain, inform, or instruct audiences. Directors and producers plan and supervise shows and performances.

Actors and actresses entertain and communicate with people through their interpretation of dramatic roles. They rely on facial and verbal expression as well as body motion for their creative affect. Making a character come to life before an audience is a job that has great glamour and fascination. However, acting requires persistence, practice, and hard work as well as a special talent. Only a few actors achieve recognition as stars on the stage, in motion pictures, or on television. A somewhat larger number are well-known, experienced performers, who frequently are cast in supporting roles. However, most actors struggle for a toehold in the profession and pick up parts wherever they can. Employment for actors is characteristically unsteady. Most actors experience frequent periods of unemployment, and many take temporary jobs, often as waiters or sales workers, while waiting for their next acting parts to come along.

Beginning stage actors generally start in "bit" parts where they speak only a few lines. If successful, they may progress to larger, supporting roles. They frequently serve as understudies for the principals. Film and television actors, in contrast, may begin in large roles or move into programs from working in commercials.

In addition to the actors with speaking parts, "extras," who have no lines to deliver, are used in almost all motion pictures and many television shows and theater productions.

Some actors move into acting-related jobs as drama coaches or directors and producers of stage, television, radio, or motion picture productions. A few teach drama in colleges and universities. Some professional actors employed by theater companies also teach acting in courses offered to the public.

Directors interpret plays or scripts and usually choose cast members for stage, movie, television, and radio productions. They conduct auditions, rehearsals and direct the work of the cast and crew. They use their knowledge of acting, voice, and movement to achieve the best possible performance and usually approve the scenery, costumes, choreography, and music.

Producers select plays or scripts and hire directors, principal members of the cast, and key production staff members. They coordinate the activities of writers, directors, managers, and other personnel, arrange financing, and decide on the size of the production and its budget.

Working Conditions

Acting demands patience and total commitment, since aspiring actors must wait for parts or filming schedules, work long hours, and travel often. Evening work is a regular part of a stage actor's life. Flawless performances require the tedious memorizing of lines and repetitive rehearsals. Performances on television programs often allow little time for rehearsal, so that the actor must deliver a good performance with very little preparation. An actor needs stamina to withstand the heat of stage or studio lights, the long irregular hours, and the adverse weather conditions that may exist "on location." When plays are on the road, traveling often is necessary. Actors may face the anxiety of intermittent employment and rejections when auditioning for work.

Directors and producers often work under stress as they try to meet schedules, stay within budgets, and resolve personnel problems.

Employment

At any one time in 1984, actors held an average of about 50,000 jobs in motion pictures, stage plays, and commercials. Directors and producers held an additional several thousand jobs. Many others were between jobs, so that the total number of people actually employed as actors, directors, and producers over the course of the year was higher. In the winter, most employment opportunities on the stage are in New York and other large cities. In the summer, stock companies in suburban and resort areas provide employment. In addition, many cities have nonprofit professional companies such as "little theaters," repertory companies, and dinner theaters, which provide opportunities for local amateur talent as well as for professional entertainers. Normally, casts are selected in New York City for shows that go "on the road."

Employment in motion pictures and films for television is centered in Hollywood and New York City, although a few studios are located in Florida and Texas and other parts of the country. In addition, many films are shot on location and employ local professionals and nonprofessionals as "day players" and "extras." A number of American-produced films are shot in foreign countries. In television, most opportunities are at the headquarters of the major networks—in New York, Los Angeles, and, to a lesser extent, Chicago. Sometimes employment opportunities are available with a few local television stations.

Training and Other Qualifications

Aspiring actors and directors should take part in high school and college plays, or work with little theaters and other acting groups for experience.

Formal dramatic training or acting experience is generally necessary, although some people enter the field without it. Training can be obtained at dramatic arts schools in New York and Los Angeles, and at about 600 colleges and universities throughout the country offering bachelor's or higher degrees in dramatic and theater arts. College drama curriculums usually include courses in liberal arts, stage speech and movement, directing, playwriting, play production, design, and history of the drama, as well as practical courses in acting. From these, the student develops an appreciation of the great plays and the roles he or she may play or direct.

Acting demands patience and total commitment.

The best way to start is to use local opportunities and to build on them. Local and regional theater experience may help obtain work in New York or Los Angeles. Modeling experience may also be helpful. Actors need talent, creative ability, and training that will enable them to portray different characters. They must have poise, stage presence, and the ability to affect an audience, plus the ability to follow directions. Physical appearance is often a deciding factor in being selected for particular roles.

Many professional actors rely on agents or managers to find them performing engagements, negotiate contracts, and plan their careers.

To become a movie extra, one must usually be listed by a casting agency, such as Central Casting, a no-fee agency that works with the Screen Extras Guild and supplies all extras to the major movie studios in Hollywood. Applicants are accepted only when the number of persons of a particular type on the list—for example, athletic young men, old ladies, or small children—is below the foreseeable need. In recent years, only a very small proportion of the applicants have succeeded in being listed. Extras in a film have very little opportunity to advance to a speaking role in that film.

There are no specific training requirements for directors and producers. Talent, experience, and business acumen are very important. Directors and producers come from different backgrounds. Actors, writers, film editors, and businessmen often enter these fields. Formal training in directing and producing is available at some colleges and universities. Individuals with a bachelor's degree or 3 years of experience may qualify for an assistant directors training program offered by the Directors Guild of America. To qualify, individuals must take an 8-hour written test and then an oral exam. However, of more than 1,000 applicants who take the exam every year, only a dozen or so qualify for the program.

The length of a performer's working life depends largely on training, skill, versatility, and perseverance. Some actors, directors, and producers never retire. Many leave the occupation, however, because they cannot find enough work to make a living.

Job Outlook

The large number of people desiring acting careers, the lack of formal entry requirements, and the relatively small number of job openings cause keen competition for acting and directing jobs. Only the most talented find regular employment. Through the mid-1990's, many openings will occur as actors leave the occupation. Faster than average growth in employment is expected as theatrical and motion picture productions increase. Nevertheless, there probably will not be openings for all jobseekers, and the keen competition for acting jobs is expected to continue.

Earnings

Actors who appear on the stage belong to the Actors' Equity Association; in motion pictures, including television films, to the Screen Actors Guild, Inc., or to the Screen Extras Guild, Inc.; and in television or radio, to the American Federation of Television and Radio Artists (AFTRA). Stage directors belong to the Society of Stage Directors and Choreographers; film and television directors belong to the Directors Guild of America. These unions and the producers of the shows sign basic collective bargaining agreements which set minimum salaries, hours of work, and other conditions of employment. Each actor, director, or producer may also sign a separate contract, which may provide for a higher salary than that specified in the basic agreement.

The minimum weekly salary for actors in Broadway productions was $700 in 1985. Those in small "off-Broadway" theaters received minimums ranging from $200 to $420 a week, depending on the seating capacity of the theater. For shows on the road, the minimum rate was $67 extra per day.

In 1985, motion picture and television actors and actresses earned a minimum daily rate of $361, or $1,256 for a 5-day week. For extras, the minimum rate was $87 a day. Television actors also receive additional compensation for reruns.

However, earnings of most actors and actresses from acting work are low because their employment is irregular. According to data from Actors Equity Association, which represents about 35,000 actors in the legitimate theater, about 20,000 of their members had no earnings in 1983; 4,700 members made less than $2,500; 6,000 members earned $5,000 or more; and only 650 members earned more than $35,000. The Screen Actors Guild (SAG) reports that over 80 percent of all performers who worked under SAG contracts in 1983 earned less than $5,000 from acting jobs; about 6 percent earned $25,000 or more. Therefore, many actors must supplement their incomes from acting by holding other jobs.

Some well-known actors have salary rates well above the minimums, and the salaries of the few top stars are many times the figures cited.

Eight performances amount to a week's work on the legitimate stage, and any additional performances are paid for as overtime. Actors usually work long hours during rehearsals; once the show opens, the hours become more regular.

Many actors who earn more than a set minimum per year are covered by a union health, welfare, and pension fund, including hospitalization insurance, to which employers contribute. Under some employment conditions, Equity and AFTRA members have paid vacations and sick leave.

The average salary for stage directors was $22,000 a year in 1983. Stage directors' salaries vary widely, however. They can range from $1,800 for directing one small show to over $1 million for a successful Broadway show. The minimum weekly salary for movie directors ranged between $3,900 and $6,200 in 1985, depending on the type of film. In 1985, minimum weekly earnings for television directors ranged between $2,700 and $6,700 for a half-hour program, depending on the type of program.

Producers usually do not get salaries; instead, they get a percentage of a show's earnings. Sometimes producers work for a set fee. Theater directors work for a set fee and usually receive a percentage of the show.

Related Occupations

Actors and actresses entertain people through their interpretations of dramatic roles by facial and verbal expression and body motions. Related occupations for people with these skills include dancers, choreographers, disc jockeys, drama teachers or coaches, and radio and television announcers. Other people working in theatrical occupations related to acting are playwrights, script writers, stage managers, and set designers. Occupations involved with the business aspects of theater productions include company managers, booking managers, and actors', directors', and playwrights' agents.

Sources of Additional Information

Information on careers in the theater is available from:

American Theater Association, 1010 Wisconsin Ave. NW., Washington, D.C. 20007.

Information about nonprofit regional theaters may be obtained from:

Theater Communications Group, Inc., 355 Lexington Ave., New York, N.Y., 10017.

Information about grants and fellowships in the performing arts is available from:

Public Information Office, National Endowment for the Arts, 1100 Pennsylvania Ave. NW., Washington, D.C. 20506.

Information on training institutions may be obtained from:

League of Professional Theatre Training Programs, Suite 1515, 1860 Broadway, New York, N.Y. 10023.

For information on the training program offered by the Directors Guild of America, contact:

Assistant Directors Training Program, 14144 Ventura Blvd., Sherman Oaks, Calif., 91423.

Dancers and Choreographers

(D.O.T. 151.027-010, and .047-010)

Nature of the Work

Dancing is an ancient and worldwide art used to interpret an idea or a story, or simply to physically express rhythm and sound. Many professional dancers perform in classical ballet, which includes the stylized, traditional repertory, or modern dance, which allows more free movement and self-expression. Others perform in dance adaptations for musical shows, in folk, ethnic, and jazz dances, and in other popular kinds of dancing. In addition to being an art form for its own sake, dance also is used to complement opera, musical comedy, and television performances.

In dance productions, performers most often work as a group, although a few top artists dance solo. Many dancers combine stage work with teaching. Choreographers often create original dances, teach them to performers, and sometimes direct and stage the presentations of their work.

Working Conditions
Dancing is strenuous. Rehearsals require very long hours and usually take place daily, including weekends and holidays. For shows on the road, weekend travel often is required. Most performances take place in the evening, and dancers must become accustomed to working late hours. Therefore, many dancers, by their thirties, transfer to related occupations such as choreographer or dance teacher or find work in other occupations. Certain celebrated dancers, however, continue performing beyond the age of 50.

Employment
Professional dancers held an average of about 10,000 jobs at any one time in 1984. Many others were between engagements so that the total number of people employed as dancers over the course of the year was greater. In addition, there were several times as many dance instructors in secondary schools, colleges and universities, dance schools, and private studios. Many teachers also performed from time to time.

New York City is the home of about one-half of the major dance companies. Other cities with full-time dance companies are Los Angeles, San Francisco, Seattle, Chicago, Dallas, Houston, Salt Lake City, Cincinnati, Cleveland, Boston, Philadelphia, Pittsburgh, and Atlanta.

Training and Other Qualifications
Serious training for a career in dancing traditionally begins by about age 12. Early ballet training begins at age 7 or 8 and is usually given by private teachers and independent ballet schools. Students who demonstrate potential in the early teens receive more intensive and advanced professional training at regional ballet schools or schools conducted under the auspices of the major ballet companies. Leading dance school companies often have summer training programs from which they select candidates for admission to their regular full-time training program. Early and intensive training also is important for the modern dancer, but modern dance generally does not require as many years of training as ballet. Most dancers have their professional auditions by age 17 or 18, but training and practice never end. For example, professional ballet dancers take from 10 to 12 lessons a week for 11 or 12 months of the year, and must spend many additional hours practicing and rehearsing.

Dancing is strenuous and requires many hours of rehearsals.

Because of the strenuous and time-consuming training required, a dancer's general education may be minimal. However, a broad, general education including music, literature, history, and the visual arts is helpful in the interpretation of dramatic episodes, ideas, and feelings.

About 210 colleges and universities confer bachelor's or higher degrees in dance, generally through the departments of physical education, music, theater, or fine arts. Most programs concentrate on modern dance but also offer courses in ballet/classical techniques.

A college education is not essential to obtaining employment as a professional dancer. In fact, ballet dancers who postpone their first audition until graduation may compete at a disadvantage with younger dancers. On the other hand, a college degree can be helpful for the dancer who retires at an early age, as often happens, and wishes to enter another field of work.

A college education is an advantage for college or university teaching. However, it is not necessary for teaching dance or choreography in a studio. Studio schools usually require teachers to have experience as performers; colleges and conservatories generally require graduate degrees, but performance experience often may be substituted.

The dancer's life is one of rigorous practice and self-discipline; therefore, patience, perseverance, and a devotion to dance are essential. Good health and physical stamina are necessary in order to practice and perform and to follow the rugged schedule often required.

Seldom does a dancer perform unaccompanied. Therefore, ability to function as part of a team is important. Dancers also should be prepared to face the anxiety of intermittent employment and rejections when auditioning for work.

Body height and build should not vary much from the average. Good feet and normal arches also are required. Above all, one must have agility, coordination, grace, a sense of rhythm, and a feeling for music, as well as a creative ability to express oneself through movement.

Employment Outlook

Although employment of dancers is expected to grow faster than the average for all occupations through the mid-1990's, the number of dancers seeking professional careers will continue to exceed the number of job openings, causing keen competition. Only the most talented will find regular employment. Some job openings will occur as dancers leave the occupation.

Best job opportunities are expected to be with regional ballet companies. Opera companies will also provide some employment opportunities. Dance groups affiliated with colleges and universities will be another source of employment. Television will also offer some opportunities. The general popularity of dance in recent years has also resulted in increased employment opportunities in teaching dance.

Earnings

Some dancers in the major opera ballet, classical ballet, and modern dance corps belong to the American Guild of Musical Artists, Inc.; those on live or videotaped television belong to the American Federation of Television and Radio Artists; those who perform in films and TV belong to the Screen Actors Guild or the Screen Extras Guild; and those in musical comedies join Actors Equity Association. The unions and producers sign basic agreements specifying minimum salary rates, hours of work, and other conditions of employment. However, the separate contract signed by each dancer with the producer of the show may be more favorable than the basic agreement.

In 1984, the minimum salary for dancers in opera and other stage productions was $60 per performance. The single performance rate for ballet dancers was $220. Dancers on tour received an allowance of $50 a day in 1984 for room and board. Minimum performance rates for dancers on television ranged from $530 to $540 for a 1-hour show. The performance rate covers 18 hours of rehearsal over a 3-day period, in addition to the performance. The normal workweek is 30 hours (6 hours per day maximum) spent in rehearsals and matinee and evening performances. Extra compensation is paid for additional hours worked.

However, the earnings of most dancers from dancing are low because their employment is irregular. They often must supplement their incomes by taking temporary jobs unrelated to dancing.

Dancers covered by union contracts are entitled to some paid sick leave and various health and welfare benefits provided by their unions. Employers contribute toward these benefits. Most other dancers do not receive any fringe benefits.

Related Occupations

Dancers express concepts and emotions through their body movements. They need grace, rhythm, and body control. Some related occupations that use actual training in dance or specialized knowledge of dance forms include acrobat, athlete, ice skater, dance critic, dance instructor, dance notator, dance therapist, and recreation worker.

Sources of Additional Information

Information on colleges and universities that teach dance is available from:

National Dance Association, a Division of the American Alliance for Health, Physical Education, Recreation, and Dance, 1900 Association Dr., Reston, Va. 22091.

For information on all aspects of dance, including job listings, contact:

American Dance Guild, 570 7th Ave., 20th Floor, New York, N.Y. 10018. Enclose a stamped, self-addressed envelope.

Information about wages and working conditions in classical ballet and modern dance is available from:

The American Guild of Musical Artists, 1841 Broadway, Room 911, New York, N.Y. 10023.

Information about the related field of dance therapy, along with a list of schools that offer degrees in the field, is available from:

American Dance Therapy Association, Suite 108, 2000 Century Plaza, Columbia, Md. 21044.

Musicians

(D.O.T. 152 except .021-010)

Nature of the Work

Professional musicians—those whose livelihoods depend upon performing for others—may play musical instruments, sing, write musical compositions, or conduct instrumental or vocal performances. They usually specialize in either classical or popular music. They may perform alone or as part of a group on stage, radio, or in TV or movie productions.

Instrumental musicians (D.O.T. 152.041-010) play a musical instrument in an orchestra, band, rock group, or jazz "combo." Classical musicians play string, brass, woodwind, or percussion instruments. Popular music performers usually play the trumpet, trombone, clarinet, flute, saxophone, organ, one of the "rhythm" instruments—the piano, string bass, drums, guitar—or one of the many electronic synthesizers.

Singers (D.O.T. 152.047-022) interpret music using their knowledge of voice production, melody, and harmony. They sing character parts or perform in their own individual styles. Singers are classified according to their voice range—soprano, contralto, tenor, baritone, or bass—or by the type of music they sing, such as opera, rock, folk, or country and western.

Composers (D.O.T. 152.067-014) create original music such as symphonies, operas, sonatas, or popular songs. They transcribe ideas into musical notation using harmony, rhythm, melody, and tonal structure.

Orchestra conductors (D.O.T. 152.047-014) lead orchestras and bands. They audition and select musicians and direct rehearsals and performances. They use conducting techniques, music theory, and harmony to achieve desired musical effects.

Choral directors (D.O.T. 152.047-010) conduct choirs and glee clubs. They audition and select singers and direct them at rehearsals and performances to achieve harmony, rhythm, tempo, shading, and other desired musical affects. To achieve these, they use conducting techniques and music theory.

Working Conditions

Musicians generally perform at night and on weekends, and also spend time in practice and rehearsal. Performances often require travel. Many musicians find only part-time work or experience unemployment between engagements. They often supplement their income with other types of jobs.

Employment

Musicians held an average of about 192,000 jobs at any one time in 1984. Others were between engagements, so that the total number of people employed as musicians during the course of the year was greater.

Many work in cities in which entertainment and recording activities are concentrated, such as New York City, Chicago, Los Angeles, Nashville, Miami Beach, and New Orleans. Many classical musicians perform with one of the 30 major symphony groups, the 37 regional orchestras, the 95 metropolitan orchestras, or the hundreds of other orchestras. Musicians also work in opera, musical comedy, and ballet productions. Some play in small chamber music groups like quartets or trios. Musicians also perform in churches, synagogues, clubs, and restaurants, and for weddings and other events. Well-known musicians and groups give their own concerts, appear on "live" radio and television, make recordings, or go on concert tours. The Armed Forces, too, offer careers in their musical organizations.

Training and Other Qualifications

Many people who become professional musicians begin studying an instrument at an early age. They may gain valuable experience by playing in a band or orchestra. Singers usually start training whenever their voices mature. Participation in school musicals or in a choir often provides good early training. Musicians need extensive and prolonged training to acquire the necessary skill, knowledge, and ability to interpret music. This training may be obtained through private study with an accomplished musician, in a college or university music program, in a music conservatory, or through practice with a group. For study in an institution, an audition frequently is necessary. Formal courses include musical theory, music interpretation, composition, conducting, and instrumental and voice instruction. Composers, conductors, and arrangers need advanced training in these subjects as well as experience.

About 500 colleges, universities, and music conservatories offer bachelor's or higher degrees in music. About 600 conservatories and colleges and universities offer a bachelor's degree in music education to qualify graduates for a State certificate to teach in an elementary or secondary school.

Those who perform popular music must have an understanding of and feeling for that style of music, but classical training may expand their employment opportunities. Although voice training is an asset for singers of popular music, many with untrained voices have successful careers. As a rule, they take lessons with private teachers when young, and seize every opportunity to make amateur or professional appearances. As musicians gain experience and become known, they perform with better known bands and orchestras.

Young persons who consider careers in music should have musical talent, versatility, creative ability, and poise and stage presence to face large audiences. Since quality performance requires constant study and practice, self-discipline is vital. Moreover, musicians who play concert and nightclub engagements must have physical stamina because of frequent traveling and night performances. They must also be prepared to face the anxiety of intermittent employment and rejections when auditioning for work.

Many musicians rely on agents or managers to find them performing engagements, negotiate contracts, and plan their careers.

Employment Outlook

The large number of people desiring to be professional musicians, the lack of formal entry requirements for many types of jobs, and the relatively small number of job openings cause keen competition for jobs. Only the most talented find regular employment. Through the mid-1990's, many openings will occur as musicians leave the occupation. In addition, employment is expected to grow about as fast as the average for all occupations. However, there are not likely to be openings for all jobseekers, and the keen competition for jobs as a musician is expected to continue.

Earnings

Earnings often depend on a performer's professional reputation as well as on geographic location—and on the number of hours worked. In 1984, median earnings for salaried musicians who usually work full time were about $400 a week. The middle 50 percent earned between $267 and $520 a week.

Minimum salaries for musicians in major symphony orchestras in 1984 ranged from $331 to $778 a week, according to the American Symphony Orchestra League. Minimums in the regional symphony orchestras ranged from about $150 to $550 a week. Minimum wages for musicians in metropolitan symphony orchestras were generally between $10 and $60 per rehearsal and $23 to $71 per concert. Some musicians earned substantially more than the minimums, however.

Musicians need intensive training and practice to acquire the necessary skill.

The 30 major symphony orchestras have seasons ranging from 36 to 52 weeks, with an average of 48 weeks. Metropolitan and regional orchestras generally have shorter seasons.

Musicians employed in motion picture recording earned a minimum of about $150 for a 3-hour session in 1984. Those employed by recording companies were paid a minimum of about $190 for a 3-hour session in 1984.

The union minimum rate for concert singers who were part of a chorus was $65 per performance in 1984. Members of an opera chorus earned a minimum daily rate of $60 per performance. A featured soloist received a minimum of $216 for each single performance. A few opera soloists and popular singers, however, earned thousands of dollars per performance. Minimum wage rates for group singers on network or syndicated television ranged between $227 and $242 per singer for a 1-hour show. Solo or duo singers received minimums of about $490 each for a 1-hour TV show. The minimum scale for phonograph recording artists is $110 per side.

Musicians employed by some symphony orchestras work under master wage agreements, which guarantee a season's work up to 52 weeks. Many other musicians may face relatively long periods of unemployment between jobs. Even when employed, however, many work part time. Thus, their earnings generally are lower than those in many other occupations. Moreover, since they may not work steadily for one employer, some performers cannot qualify for unemployment compensation, and few have either sick leave or vacations with pay. For these reasons, many musicians give private lessons or take jobs unrelated to music to supplement their earnings as performers.

Many musicians belong to a branch of the American Federation of Musicians, an AFL-CIO union. Professional singers usually belong to a branch of the Associated Actors and Artistes of America, an AFL-CIO union.

Related Occupations

There are many music-related occupations. These include librettists, songwriters, and music therapists. A large number of music teachers work in elementary and secondary schools, music conservatories and colleges and universities, or are self-employed. Many who teach music also perform.

A technical knowledge of musical instruments is required by instrument repairers, tuners, and copyists. In addition, there are a number of occupations in the business side of music such as booking agents, concert managers, music store owners and managers; salespersons of records, sheet music, and musical instruments; and music publishers. Others whose work involves music are disc jockeys, music critics, sound and audio technicians, music librarians, and radio and TV announcers.

Sources of Additional Information

For answers to specific questions about wages, hours of work, and working conditions for professional musicians, contact:

American Federation of Musicians (AFL-CIO), 1500 Broadway, New York, N.Y. 10036.

For information about wages and working conditions for singers, contact:

American Guild of Musical Artists (AFL-CIO), 1841 Broadway, New York, N.Y. 10023.

The requirements for certification of organists and choirmasters are available from:

American Guild of Organists, 815 Second Ave., Suite 318, New York, N.Y. 10017.

For programs in music teacher education, contact:

Music Educators National Conference, 1902 Association Dr., Reston, Va. 22091.

Information about certification of private music teachers is available from:

Music Teachers National Association, 2113 Carew Tower, Cincinnati, Ohio 45202.

Information on accredited schools of music is available from:

National Association of Schools of Music, 11250 Roger Bacon Dr., Reston, Va. 22090.

A brochure entitled *Careers in Music*, produced jointly by the three organizations listed above, is available from any of the three.

Information about careers in orchestra management is available from:

American Symphony Orchestra League, 633 E St., NW., Washington, D.C. 20004.

Technologists and Technicians, Except Health

Technologists and technicians perform much of the detailed technical work necessary in engineering, scientific, computer, library, legal, broadcasting, and other professional activities. They focus on the practical elements of the activities, operating and maintaining technical equipment and systems, or providing skilled help with the research, design, testing, and actual creation of the end product of the activity. Related managerial and professional personnel, with whom they work closely, establish the overall theory, design, and method of production; technologists and technicians bring their ideas to fruition.

Technologists and technicians employ specialized skills to perform the day-to-day tasks needed to carry out a project or run an operation. They may operate testing and measuring equipment in the laboratory or the field; make detailed drawings of new designs of buildings or machinery; record and transmit radio and television programs; comb reference materials for past instances of a legal argument having been successfully used in court, or organize and maintain the reference materials for use by others; program computers or machine tools to perform desired operations; or guide airplanes safely to their destinations. They are employed in nearly every industry, wherever technical assistance in a specialized area is needed.

Most technologists and technicians are supervised by professional workers—for example, engineering technicians by engineers, library technicians by librarians, and legal assistants by lawyers. They are usually part of a team that is engaged in a particular project or operation.

In most specialties, technologists and technicians use complex electronic equipment or mechanical instruments, technical manuals, or other specialized materials. For example, air traffic controllers use radar tracking devices to monitor the positions of airplanes and guide pilots to safe landings; legal assistants use specialized law books and reference materials to research legal topics; and programmers use complex programming languages to direct computers to perform specific tasks.

Because of the diversity of technologist and technician occupations, training requirements vary widely. A high school diploma is a minimum requisite; most jobs, in fact, require specialized postsecondary training. Training is offered at junior and community colleges, technical institutes, vocational schools, and extension divisions of colleges and universities. These programs usually emphasize practical courses and "hands-on" experience in a particular specialty. Programs vary in length. For example, most legal assistant programs require 2 years' work. On the other hand, many programmers complete 4-year bachelor's degree programs.

In addition to acquiring a formal education, technologists and technicians often receive on-the-job training. For example, programmers generally work under close supervision for several months; air traffic controllers must complete several years of progressively more responsible work to become fully qualified. Occasionally, technologists and technicians take additional courses to keep abreast of technological advances in their specialty.

The knowledge and personal characteristics required in these jobs vary. For example, engineering, science, and electrical and electronics technicians need a good foundation in mathematics and the basic sciences—physics, chemistry, and biology. Legal assistants and library technicians need strong communication skills.

Whatever their occupation, technologists and technicians must be able to apply practical knowledge to solve particular problems. Because they are often part of a team, the ability to follow directions well is important. They must be patient, precise, and organized in their work habits. Also, many need manual dexterity to work with various kinds of equipment.

The following section describes the nature of the work, employment, training requirements, job outlook, earnings, and working conditions for a representative sample of technologist and technician occupations.

Engineering and Science Technicians

Engineering and science technicians apply scientific, engineering, and mathematical principles to practical situations to assist scientists in research and development, manufacturing, sales, and service. Technicians frequently use and sometimes repair complex electronic and mechanical instruments and laboratory equipment. Many use computers or computer-aided design and drafting systems.

Drafters prepare detailed plans of manufactured products, buildings, and other structures to serve as a guide for manufacturing and construction workers. Their drawings are based on rough sketches and specifications prepared by engineers, architects, and scientists.

Engineering technicians, science technicians and *electrical and electronics technicians* assist scientists and engineers in research and development by setting up experiments and calculating results. Technicians in production test product quality and check that plans and procedures are followed. Some technicians work as manufacturers' field representatives, giving advice on the installation or maintenance of complex machinery. Other technicians sell or service technical products.

Engineering and science technicians usually need post-high school training, which is often obtained in a technical institute or junior or community college. Some technicians gain their training in the Armed Forces or through on-the-job training. Others, especially science technicians, obtain their training in a 4-year college.

Drafters

(D.O.T. 001.261; 002.261; 003.281; 005.281; 007.161-010, -014, and -018, .261, and .281; 010.281-010, -014, -018; 014.281; -017 except .261-010; 019.161-010, and .261-014)

Nature of the Work

When building a satellite, television set, or bridge, workers follow drawings prepared by drafters that show the exact dimensions and specifications of the entire design and each of its parts.

Drafters prepare detailed drawings based on rough sketches, specifications, and calculations made by scientists, engineers, architects, and designers. Final drawings contain a detailed view of the object from all sides as well as specifications for materials to be used, procedures to be followed, and other information to carry out the job.

In preparing drawings, drafters use compasses, dividers, protractors, triangles, and other drafting devices. They also use technical handbooks, tables, and calculators to help solve problems.

Drafters are increasingly using computer-aided design (CAD) systems. Instead of sitting at drafting boards, drafters who use CAD systems sit at computer work stations and may make the drawing on a TV-like screen. In some cases, the design may never be placed on paper. It may be stored electronically or, in some factories, may be used to guide automatic machinery. These systems free drafters from much routine drafting work, permit many variations of a design to be easily prepared, and allow a design to be viewed from various angles and perspectives not usually available with more traditional drafting methods so that design work can be better, faster, and more thorough. However, much drafting, especially in small offices or at field sites, will continue to be done by traditional methods.

Drafters usually specialize in a particular field of work, such as mechanical, electrical, aeronautical, civil, or architectural drafting.

Working Conditions

Although drafters usually work in well-lighted and well-ventilated rooms, they often must sit at drawing boards or computer terminals and do very detailed work for long periods of time. This work may cause eyestrain and back discomfort.

Employment

Drafters held over 345,000 jobs in 1984. About one-third of all drafters worked for engineering and architectural firms, and about one-third worked in durable goods manufacturing industries, such as machinery, electrical equipment, and fabricated metals. Drafters also were employed in the construction, transportation, communications, and utilities industries.

Over 16,000 drafters worked in government in 1984, primarily at the State and local level. Most drafters in the Federal Government worked for the Department of Defense.

Training, Other Qualifications, and Advancement

Employers prefer applicants for drafting positions who have 2 years of post-high school training in technical institutes, junior and community colleges, or extension divisions of universities. Some persons receive training and experience in the Armed Forces. Over 40 percent of those who obtained jobs as drafters recently had some college or technical institute training. In addition, many had other postsecondary training.

Training for a career in drafting should include courses in mathematics, physical sciences, mechanical drawing, and drafting. Courses in shop practices and shop skills also are helpful since most higher level drafting jobs require knowledge of manufacturing or construction methods. Many technical schools offer courses in structural design, architectural drawing, and engineering or industrial technology.

An exposure to computer-aided design techniques is helpful, but employers mainly look for applicants with a thorough knowledge of drafting fundamentals, knowledge of design theory, and neatness. Because there are many different kinds of CAD systems in use, training and experience in one particular system may not be very helpful. Many employers provide on-the-job training in their CAD system.

Those planning careers in drafting

Neatness and the ability to pay close attention to detail are important for drafters.

should be able to do freehand drawings of three-dimensional objects and also detailed work requiring a high degree of accuracy. Neatness and the ability to pay close attention to details are important qualities for drafters. They should also have good eyesight and manual dexterity. In addition, they should be able to function as part of a team since they work directly with engineers, architects, designers, and other workers. Artistic ability is helpful in some specialized fields.

Beginners usually start as junior drafters doing routine work under close supervision. After gaining experience, they do more difficult work with less supervision and may advance to senior drafters or supervisors. With appropriate college courses, they may become engineers, designers, or architects.

Job Outlook

Employment of drafters is expected to grow about as fast as the average for all occupations through the mid-1990's. Industrial growth and the increasingly complex design problems associated with new products and processes will greatly increase the demand for drafting services. However, widespread use of CAD equipment—which increases drafters' productivity—is expected to partially offset this growth in demand. Although earlier it had been expected that CAD systems would eliminate many drafters, in most situations where CAD systems have been installed, there have been few if any layoffs. Instead, CAD systems have been used to produce more and better variations of a design. As with computer applications in other areas, the ease of obtaining computer-generated information stimulates a demand for more information. However, in some situations, lower level drafters doing routine work could be replaced by CAD technology, and layoffs of drafters unable or unwilling to switch to CAD techniques are possible. In addition to jobs arising from growth in demand for drafters, a large number of openings will result each year from the need to replace drafters who transfer to other occupations or leave the labor force.

Drafters are highly concentrated in industries that are sensitive to cyclical swings in the economy, such as engineering and architectural services and durable goods manufacturing. During an economic recession, drafters may be laid off as fewer buildings and manufactured products are designed and fewer drafting services are needed.

Earnings

Median annual earnings of drafters were about $20,900 in 1984; the middle 50 percent earned between $15,900 and $26,700 annually. Ten percent earned less than $12,000 and 10 percent, more than $33,000.

In private industry, beginning drafters averaged about $12,600 a year in 1984, while more experienced drafters averaged between $16,100 and $23,100 a year. Senior drafters averaged about $29,000 a year.

Related Occupations

Other workers who are required to prepare or understand detailed drawings, make accurate and precise calculations and measurements, and use various measuring devices include architects, engineering technicians, engineers, landscape architects, photogrammetrists, and surveyors.

Sources of Additional Information

Information on schools offering programs in drafting and other areas is available from:

National Association of Trade and Technical Schools, 2021 K St. NW., Washington, D.C. 20006.

Electrical and Electronics Technicians

(D.O.T. 003.161; .261; 019.281; 194.381; 726.261; .281-010; and 828.261-018)

Nature of the Work

Knowledge of science, mathematics, and principles of electricity and electronics enables electrical and electronics technicians to work in all phases of business and government—from research and design to manufacturing, sales, and customer service. Although their jobs are more limited in scope and more practically oriented than those of engineers or scientists, they often apply the theoretical knowledge developed by engineers and scientists to actual situations. Electrical and electronics technicians develop, manufacture, and service equipment and systems such as radios, radar, sonar, television, industrial and medical measuring or control devices, navigational equipment, and computers. Because the field is so broad, these technicians often specialize in one area, such as automatic control devices or electronic amplifiers.

Technicians working in design, production, or customer service use sophisticated measuring and diagnostic devices to test, adjust, and repair equipment. In many cases, they must understand the purpose for which the electronic device is being used. To design equipment for space exploration, for example, a technician must consider the need for minimum weight and volume and maximum resistance to shock, extreme temperature, and pressure.

In research and development, one of the largest areas of employment, technicians set up equipment, prepare experiments, and calculate the results, sometimes with the aid of computers. They also assist engineers and scientists by making prototype versions of newly designed equipment and, frequently, by doing routine design work.

In production, technicians usually follow the general directions of engineers and scientists, but often without close supervision. They may prepare specifications for components and devise and conduct tests to insure product quality. They often supervise production workers to make sure they follow prescribed procedures.

As sales workers or field representatives for manufacturers, wholesalers or retailers, technicians give advice on the installation, operation, and maintenance of complex equipment and may write specifications and technical manuals.

Although electrical and electronics technicians often repair equipment, workers whose main job is the repair of electronic equipment are included elsewhere in the *Handbook* under electrical and electronic equipment repairers.

Electrical and electronics technicians often use test equipment.

Working Conditions

Most electrical and electronics technicians work regular hours in laboratories, offices, electronics shops, or industrial plants. Those in sales and service usually work much of the time in customers' facilities. Some occasionally are exposed to electric shock hazards from equipment.

Employment

Electrical and electronics technicians held about 404,000 jobs in 1984, over one-third of which were in manufacturing. The largest manufacturing employers were the electrical equipment, machinery, and professional and scientific equipment industries. Over one-fourth worked in wholesale trade, mainly for distributors of machinery, equipment, and electrical goods. Large numbers also worked for public utilities and service and repair companies.

The Federal Government employed about 20,000 electrical and electronics technicians, mainly in the Departments of Defense and Transportation. State and local governments employed about 6,000.

Training, Other Qualifications, and Advancement

Although persons can qualify for electrical or electronics technician jobs through many combinations of work experience and education, most employers prefer applicants who have had some specialized technical training. Specialized training is available at technical institutes, junior and community colleges, extension divisions of colleges and universities, and public and private vocational-technical schools. Persons with college courses in engineering, science, and mathematics may qualify for some positions but additional specialized training or experience may be needed.

Many electrical and electronics technicians qualify for their jobs through on-the-job training or on the basis of experience gained in the Armed Forces. Some qualify through correspondence schools.

Some of the types of schools that provide electrical and electronic training are discussed in the following paragraphs.

Technical Institutes. Technical institutes offer training to qualify students for a job immediately after graduation with a minimum of on-the-job training. They may be publicly or privately operated. Many offer 2-year associate degree programs, and are similar to or part of a community college, or are part of State university systems; others award certificates of completion for various programs, many of which are of less than 2 years' duration. In general, technical institute students receive intensive technical training but less theory and general education than they would in junior or community colleges. However, because the kind and quality of programs operated by technical institutes vary considerably, prospective students should investigate carefully the accreditation status of the school they are considering and the suitability of the various programs offered.

Junior and Community Colleges. Curriculums in junior and community colleges which prepare students for technician occupations are often similar to those in technical institutes but may also emphasize theory and liberal arts. After completing the 2-year program, some graduates qualify for jobs as electrical or electronics technicians while others continue their education at 4-year colleges.

Area Vocational-Technical Schools. These postsecondary public institutions serve students from surrounding areas and emphasize training in skills needed by employers in the local area. Most require a high school diploma or its equivalent for admission.

Other Training. Some large corporations conduct training programs and operate private schools to meet their needs for electrical and electronics technicians trained in specific areas; such training rarely includes general studies. The Armed Forces also train many types of electrical and electronics technicians. Although military job requirements generally differ from those in the civilian economy, military technicians often find private or civilian government jobs with only minimal additional training.

Many private technical and correspondence schools specialize in electronics. Some of these schools are owned and operated by large corporations that have the resources to provide up-to-date training in a technical field.

Persons interested in a career as an electrical or electronics technician should have an aptitude for mathematics and science and enjoy technical work. An ability to do detailed work with a high degree of accuracy is necessary; for design work, creative talent also is desirable. Electrical and electronics technicians are part of a scientific team, and often work closely with engineers and scientists as well as other technicians and skilled workers. Technicans in service and sales should be able to work independently and deal effectively with customers.

Electrical and electronics technicians usually begin work as trainees in routine positions under the close supervision of an experienced technician, scientist, or engineer. As they gain experience, they carry out more difficult assignments under only general supervision. Some eventually become supervisors and, a few, electrical engineers.

Job Outlook

Employment of electrical and electronics technicians is expected to increase much faster than the average for all occupations through the mid-1990's due to anticipated continued strong demand for computers, communications equipment, and electric products for military, industrial, and consumer use. More technicians will be needed to help develop, produce, and service these products. Opportunities will be best for graduates of 2-year postsecondary school technical training programs.

Although a relatively small proportion of electrical and electronics technicians leave the occupation each year, most job openings will be to replace those who transfer to other occupations, retire, or leave the labor force.

Since many jobs for electrical and electronics technicians are defense related, cutbacks in defense spending could result in layoffs in defense-related industries.

Earnings

Median annual earnings of full-time electrical and electronics technicians were about $21,800 in 1984; the middle 50 percent earned between $17,300 and $28,000. Ten percent earned below $13,700 and 10 percent earned over $34,700.

In the Federal Government, electrical and electronics technicians could start at $11,458, $12,862, or $14,390 in 1985, depending on their education and experience.

Related Occupations

Electrical and electronics technicians apply scientific principles in their work. Others whose work involves the application of scientific principles include engineering technicians, science technicians, broadcast technicians, drafters, surveyors, and health technicians and technologists. Others who repair electrical and electronic equipment are communications equipment mechanics, data processing equipment repairers, electronic home entertainment equipment repairers, and office machine repairers.

Sources of Additional Information

For information on a career as an electrical and electronics technician, contact:

Jets Inc., 345 East 47th St., New York, N.Y. 10017.

International Society of Certified Electronics Technicians, 2708 W. Berry, Suite 3, Fort Worth, Tex. 76109.

Engineering Technicians

(D.O.T. 002.280, .281; 005.261; 006.261; 007.161-026 and -030, .167-010 and -022, .181; 008.261; 010.261-010 and -026; 011.261-010 and -014, .281, .361; 012.261-014, .267; 013.161; 017.261-010; 019.161-014, .261-022, .267, .381; 194.262-014, -018, .362-014, .382; 199.261-014; 761.281-014; 962.167-010 and .382)

Nature of the Work

Engineering technicians use their knowledge of science, engineering, mathematics, machinery, and technical processes in research and development, manufacturing, sales, and customer service. They often apply the principles, designs, or procedures developed by engineers to practical situations. Many engineering technicians assist engineers and scientists, especially in research and development. Other technicians, such as those in service jobs, work on their own.

In research and development, engineering technicians set up equipment, prepare experiments, calculate or record the results, sometimes with the aid of computers, and assist engineers in developing laboratory equipment. Some build experimental equipment or models and others do routine design work, sometimes using computer-aided design equipment.

In manufacturing, engineering technicians follow the general directions of engineers, often without close supervision. They may prepare specifications for materials, devise and run tests to ensure product quality, or study ways to improve manufacturing efficiency. They may also supervise production workers to make sure they follow prescribed procedures.

Engineering technicians also work as field representatives of manufacturers, wholesalers, or retailers. They advise customers on the installation, operation, and maintenance of complex technical equipment, and may write repair or operating manuals.

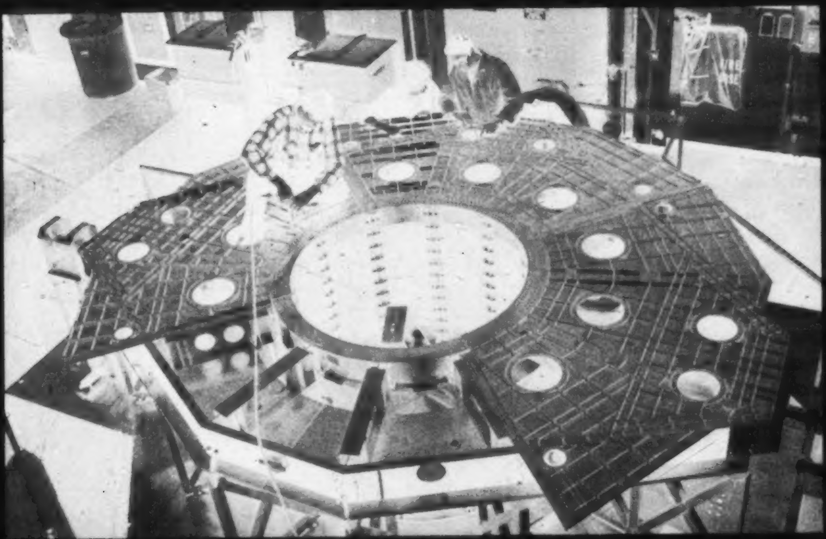
Civil engineering technicians assist civil engineers in planning, designing, and constructing highways, buildings, bridges, dams, wastewater treatment systems, and other structures and do related surveys and studies. Some civil engineering technicians inspect water and wastewater treatment systems to ensure that pollution control requirements are met. Others estimate costs, specify materials to be used, and participate in designing highways, dams, and other structures.

Industrial engineering technicians assist industrial engineers on problems involving the efficient use of personnel, materials, and machines to produce goods and services. They prepare layouts of machinery and equipment, plan the flow of work, make statistical studies, and analyze production costs. They also conduct time and motion studies to improve efficiency in manufacturing plants.

Mechanical engineering technicians assist engineers in design and development work by making sketches and rough layouts of proposed machinery and other equipment and parts. In planning and testing experimental machines, they record data, make computations, plot graphs, analyze results, and write reports. When a product is ready for production, mechanical engineering technicians prepare layouts and drawings of the assembly process and of parts to be manufactured. They estimate labor costs, equipment life, and plant space. Some test and inspect machines and equipment in manufacturing departments or work with engineers to eliminate production problems.

Working Conditions

Most engineering technicians work regular hours in laboratories, offices,



Engineering technicians set up experimental equipment.

and industrial plants. Service representatives usually spend much of their time working in customers' establishments.

Employment

Engineering technicians held almost 326,000 jobs in 1984. Over 40 percent worked in manufacturing, mainly in the transportation equipment, electrical equipment, machinery, and professional and scientific equipment industries. Almost one-quarter worked in service industries, mostly in engineering or business services companies.

In 1984, the Federal Government employed about 30,000 engineering technicians. Over half worked for the Defense Department; others worked for the Agriculture and Interior Departments, the Tennessee Valley Authority, and the National Aeronautics and Space Agency. State governments employed about 28,000 and local governments about 13,000.

Training, Other Qualifications, and Advancement

Although there are many ways to obtain training as an engineering technician, most employers prefer applicants who have had specialized technical training in associate-degree-granting technical institutes, junior and community colleges, extension divisions of colleges and universities, or public and private vocational-technical schools. Persons with college courses in science, engineering, and mathematics may also be able to qualify for some positions with additional training and experience.

Persons also can qualify through on-the-job training, apprenticeship programs, or correspondence schools. Armed Forces experience also may be acceptable for some kinds of engineering technician jobs. Some of the types of schools that provide training for engineering technicians are discussed in the following paragraphs.

Technical Institutes. Technical institutes offer training to qualify students for a job as an engineering technician immediately after graduation with a minimum of on-the-job training. In general, students receive intensive technical training but less theory and general education than they would in junior or community colleges. Many technical institutes are similar to or are part of a community college, and others are part of State university systems. These schools usually offer 2-year associate degree programs. Other technical institutes are run by private, often for-profit, organizations (sometimes called proprietary schools). Programs in these schools vary considerably in length and type of courses offered. Some are 2-year programs, many of which offer an associate degree at completion.

Junior and Community Colleges. Curriculums in junior and community colleges which prepare students for technical occupations are similar to those in technical institutes but in addition emphasize theory and liberal arts. Often there may be little or no difference between technical institute and community college programs. However, courses taken at junior or community colleges are more likely to be accepted for credit at 4-year colleges than those at technical institutes.

Four-year Colleges. Many engineering technicians obtained some or all of their training in a 4-year college. Although 4-year colleges usually do not offer engineering technician training, college courses in science, engineering, and mathematics are useful for obtaining a job as an engineering technician.

Area Vocational-Technical Schools. These postsecondary public institutions serve local students and emphasize training needed by employers in the area. Most require a high school diploma or its equivalent for admission.

Other Training. The Armed Forces offer training in many areas, some of which can be applied in civilian engineering technican jobs. Some additional training may be needed, depending on the military skills acquired and the kind of job, but often this is gained on the job. Some correspondence schools also offer training for engineering technicians.

Persons interested in a career as an engineering technician should have an aptitude for mathematics and science and should take as many high school science and math courses as possible. They should enjoy technical and mechanical work and be able to work well with others since they are often part of a team of engineers and other technicians. Engineering technicians in sales, service, and repair work should be able to work independently and deal effectively with customers.

Engineering technicians usually begin doing routine work under the close supervision of an experienced technician, engineer, or scientist. As they gain experience, they are given more difficult assignments with only general supervision. Some engineering technicians eventually become supervisors, and a few, engineers.

Job Outlook

Employment of engineering technicians is expected to increase faster than the average for all occupations through the mid-1990's due to anticipated continued rapid growth in the output of technical products as industry increases its investment in factories and machinery and as defense expenditures increase. Competitive pressures and advancing technology will force companies to improve and update product designs more rapidly than in the past, further adding to the growth in requirements.

Despite the projected faster than average growth, most job openings will be to replace technicians who transfer to other occupations or leave the labor force.

Earnings

Median annual earnings of full-time engineering technicians were about $21,300 in 1984; the middle 50 percent earned between $16,500 and $29,300. Ten percent earned less than $12,800, and 10 percent earned over $37,000.

In the Federal Government, engineering technicians could start at $11,458, $12,862, or $14,390 in 1985, depending on their education and experience.

Related Occupations

Engineering technicians apply scientific and engineering principles in their work. Other workers who apply similar principles include science technicians, electrial and electronics technicians, drafters, surveyors, broadcast technicians, and health technologists and technicians.

Source of Additional Information

For information on a career as an engineering technician, contact:

Jets, Inc., 345 East 47th St., New York, N.Y. 10017.

Science Technicians

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

Science technicians use their knowledge of science, mathematics, and technical processes to assist scientists in research and development and in a variety of production-related tasks.

In research and development, science technicians construct or maintain experimental equipment, set up and monitor experiments, and calculate and record the results. In production, science technicians follow the general directions of scientists and engineers, often without close supervision. Many do quality control testing to ensure that products contain the proper proportions of ingredients or meet strength and durability standards. In the petroleum industry, science technicians perform a wide variety of technical services.

Science technicians usually specialize in a particular area and often have a more specific job title, such as chemical technician, for example, rather than the general title of science technician.

Agricultural technicians work with agricultural scientists in food production and processing. Some conduct tests and experiments to improve the yield and quality of crops or to increase the resistance of plants and animals to disease, insects, or other hazards. Other agricultural technicians do animal breeding and nutrition work.

Biological technicians work with biologists studying living organisms. Microbiological technicians study microscopic organisms and may do medical research. Biological technicians also analyze biological substances such as blood, food, and drugs; some examine evidence in criminal investigations.

Chemical technicians work with chemists and chemical engineers, developing and using chemicals and related products and equipment. Most do research and development, testing, or other laboratory work. They often set up and conduct tests and experiments and collect and analyze data. Some chemical technicians collect and analyze samples of air and water to monitor pollution levels.

Nuclear technicians operate nuclear test and research equipment, monitor radiation, and assist nuclear engineers and physicists in research. Some also operate remote control equipment to manipulate radioactive materials or materials to be exposed to radioactivity.

Mathematical technicians work with scientists and engineers to solve computational problems encountered in research and development and other areas. They also apply standardized mathematical formulas to translate data into graphs and charts.

Petroleum technicians perform a variety of tasks related to oil and natural gas production. Some petroleum technicians measure and record physical and geologic conditions in oil or gas wells using instruments lowered into wells or by analysis of the mud that is circulated down and back up wells. Other petroleum technicians help geologists search for new oil and gas deposits by collecting and examining geological data or by testing geological samples to determine petroleum and mineral content. Some petroleum technicians are called scouts. They investigate and collect information about oil and gas well drilling operations, geological and geophysical prospecting, and land or lease contracts.

Other science technicians collect weather information, test manufactured products to ensure their quality, or assist oceanographers.

Working Conditions

Science technicians work under a wide variety of conditions. Many work indoors, usually in laboratories, and have regular hours. Some occasionally work irregular hours to monitor experiments that can't be completed during regular working hours. Others such as agricultural and petroleum technicians perform much of their work outdoors, sometimes in remote locations, and some may be exposed to hazardous conditions. Chemical technicians sometimes work with toxic chemicals, nuclear technicians may be exposed to radiation, and biological technicians sometimes work with disease-causing organisms. However, there is little risk if the proper safety procedures are followed.

Many science technicians work in laboratories.

Employment

Science technicians held about 239,000 jobs in 1984. About 40 percent worked in manufacturing, especially in the chemical, petroleum refining, and food processing industries. Over one-quarter worked in service industries, mainly in colleges and universities.

In 1984, the Federal Government employed almost one-fifth of all science technicians, mostly in the Departments of Defense, Agriculture, Commerce, and Interior.

Training, Other Qualifications, and Advancement

There are several ways to qualify for jobs as science technicians. Most employers prefer applicants who have at least 2 years of specialized training or experience. Many junior and community colleges offer associate degree programs which either give training for a specific type of science technician job or give a more general education in science and mathematics. Technical institutes generally offer the technical training needed for a specific type of job but less theory and general education than junior or community colleges. The length of programs at technical institutes varies, although 2-year associate degree programs are common. Many science technicians have a bachelor's degree in science or mathematics, or have had science and math courses in 4-year colleges. Some with bachelor's degrees become science technicians because they can't find a job as a scientist. In some cases, they may be able to move into jobs as scientists, managers, or sales workers in the organization.

Some companies offer training programs or extensive on-the-job training for science technician jobs. Technicians also qualify for their jobs with training obtained in the Armed Forces.

Persons interested in a career as a science technician should have an aptitude for science and mathematics and should take as many high school science and math courses as possible. They should also be able to work well with others since technicians often are part of a team.

Advancement opportunities for science technicians vary by the type of technician and employer. Technicians usually begin work as trainees in routine positions under the direct supervision of a scientist or experienced technician. As they gain experience, they take on more responsibility and carry out a particular assignment under only general supervision. Some eventually become supervisors.

Job Outlook

Employment of science technicians is expected to increase about as fast as the average for all occupations through the mid-1990's due to an expected increase in the need for science technicians to work on research projects and to help develop and produce technical products. However, employment in the various technician specialties will be affected by differing industry growth patterns or product demand. For example, since the chemical and oil industries are expected to grow slowly, employment of chemical and petroleum technicians may grow more slowly than employment of biological technicians, more of whom will be needed in the rapidly growing field of biotechnology research.

Despite the projected growth, most job openings will be to replace technicians who transfer to other occupations or leave the labor force.

Earnings

Median annual earnings of science technicians were about $21,000 in 1984; the middle 50 percent earned between $15,000 and $28,000. Ten percent earned less than $12,000, and 10 percent earned over $37,000.

In the Federal Government in 1985, science technicians could start at $11,458, $12,862, or $14,390, depending on their education and experience. The average salary for science technicians employed by the Federal Government was $20,300 in 1984.

Related Occupations

Other technicians who apply scientific principles in their work include engineering technicians, electrical and electronics technicians, broadcast technicians, drafters, and health technologists and technicians. Some of the work of agricultural and biological technicians is related to that of agriculture and forestry occupations.

Sources of Additional Information

For information about a career as a chemical technician, contact:

American Chemical Society, Education Division, Career Services, 1155 16th St. NW., Washington, D.C. 20036.

Norman J. Worth, Chairman, National Conference of Chemical Technicians Affiliates, E 302/315, DuPont Experimental Station, Wilmington, Del. 19898.

For information about a career as a biological technician and other biology-related careers, contact:

American Institute of Biological Sciences, 1401 Wilson Blvd., Arlington, Va. 22209.

Other Technicians

Air Traffic Controllers

(D.O.T. 193.162 except -022; .167-010)

Nature of the Work

Air traffic controllers are the guardians of the airways. They keep track of planes flying within their assigned area and make certain that they are safe distances apart. Their immediate concern is safety, but controllers also must direct planes efficiently to minimize delays. Some regulate airport traffic; others regulate flights between airports.

Although airport tower or terminal controllers watch over all planes travelling through the airport's airspace, their main responsibility is to organize the flow of aircraft in and out of the airport. Relying on radar and/or visual observation, they closely monitor each plane to maintain a safe distance between all aircraft and to guide pilots between the hangar or ramp and the end of the airport's airspace.

During arrival or departure, each plane is handled by several controllers. As a plane approaches an airport, the pilot radios ahead to inform the terminal of its presence. The *arrival controller* in the radar room just beneath the control tower has a copy of the plane's flight plan and already has observed the plane on radar. If the way is clear, the arrival controller directs the pilot to a runway; if the airport is busy, the plane is fitted into a traffic pattern with other aircraft waiting to land. As the plane nears the runway, the pilot is asked to contact the tower. There, a *local controller*, who also is watching the plane on radar, monitors the aircraft the last mile or so to the runway, delaying any departures that would interfere with the plane's landing. Once the plane has landed, a *ground controller* in the tower directs it along the taxiways to its assigned gate. The ground controller works almost entirely by sight, but may use radar if visibility is very poor.

A similar procedure is used for departures. The ground controller directs the plane to the proper runway. The local controller then informs the pilot about conditions at the airport, such as the weather, speed and direction of wind, and visibility. The local controller also issues runway clearance for the pilot to take off. Once in the air, the plane is guided out of the airport's airspace by the *departure controller*.

After each plane departs, airport tower controllers notify *enroute controllers* who will next take charge. There are 24 enroute control centers located around the country. Airplanes generally fly along designated routes; each center is assigned a certain airspace containing many different routes. Enroute controllers work in teams of up to three members, depending on how heavy traffic is; each team is responsible for a section of the center's airspace. A team, for example, might be responsible for all planes that are between 30 to 100 miles north of an airport and flying at an altitude between 6,000 and 18,000 feet.

To prepare for planes about to enter the team's airspace, the *radar associate controller* organizes flight plans coming from printing machines. If two planes are scheduled to enter the team's airspace at a similar time, location, and altitude, this controller may arrange with the preceding control unit for one plane to change its flight plans. The previous unit may have been another team at the same or an adjacent center, or a departure controller at a neighboring terminal. As a plane approaches a team's airspace, the *radar controller* accepts responsibility for the plane from the previous controlling unit. The controller also delegates responsibility for the plane to the next controlling unit when the plane leaves the team's airspace.

The radar controller, who is the senior team member, observes the planes in the team's airspace on radar and communicates with the pilots when necessary. Radar controllers warn pilots about nearby planes, bad weather conditions, and other possible hazards. Two planes on a collision course will be directed around each other. If a pilot wants to change altitude in search of better flying conditions, the controller will check to determine that no other planes will be along the proposed path. As the flight progresses, the team responsible for the aircraft notifies the next team in charge. Through team coordination, the plane arrives safely at its destination.

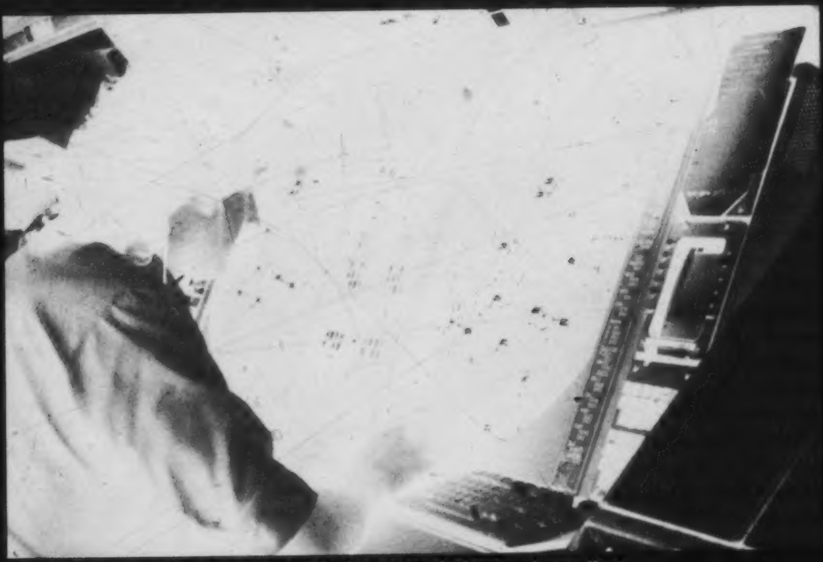
Both airport tower and enroute controllers usually control several planes at one time and often have to make quick decisions about completely different activities. For example, a controller might direct a plane on its landing approach and at the same time provide pilots entering the airport's airspace with information about conditions at the airport. While instructing these pilots, the controller also would observe other planes in the vicinity, such as those in a holding pattern waiting for permission to land, to ensure that they remain well separated.

In addition to airport towers and enroute centers, air traffic controllers also work in flight service stations operated at over 300 locations. These controllers provide pilots with information on the station's particular area, including terrain, preflight and inflight weather information, suggested routes, and other information important to the safety of a flight.

Working Conditions

Controllers work a basic 40-hour week; however, they may work additional hours for which they receive overtime pay or equal time off. Because most control towers and centers operate 24 hours a day, 7 days a week, controllers rotate night and weekend shifts.

During busy times, controllers must work rapidly and efficiently. This requires total concentration to keep track of several planes at the same time and make certain all pilots receive correct instructions.



Controllers usually are responsible for several planes at one time.

Employment

Air traffic controllers held about 22,000 jobs in 1984, at airports—in towers and flight service stations—and in enroute traffic control centers. The overwhelming majority worked for the Federal Aviation Administration (FAA); a small number of civilian controllers worked for the Department of Defense.

Training, Other Qualifications, and Advancement

Air traffic controller trainees are selected through the competitive Federal Civil Service system. Applicants must pass a written test that measures their ability to learn the controller's duties. Applicants with experience as a pilot, navigator, or military controller can get points added to their rating by scoring well on the occupational knowledge portion of the examination. Arithmetic computation, abstract reasoning, and three-dimensional spatial visualization are among the aptitudes measured by the examination. In addition, applicants generally must have 3 years of general work experience or 4 years of college, or a combination of both. Applicants must pass physical and psychological examinations. For airport tower and enroute center positions, applicants must be less than 31 years old. Those 31 years old and over are eligible for positions at flight service stations.

Potential controllers should be articulate, since directions to pilots must be given quickly and clearly. A good memory also is important because controllers constantly receive information which they must immediately grasp, interpret, and remember. Decisiveness is also required since controllers often have to make quick decisions.

Successful applicants receive a combination of on-the-job and formal training to learn the fundamentals of the airway system, FAA regulations, controller equipment, and aircraft performance characteristics. They receive 11-17 weeks of intensive screening and training at the FAA Academy in Oklahoma City. It then takes several years of progressively more responsible work experience, interspersed with considerable classroom instruction and independent study, to become a fully qualified controller.

At airports, new controllers begin in the tower, where they first serve as ground controller, then local controller, departure controller, and finally, arrival controller. At an enroute traffic control center, new controllers first deliver printed flight plans to teams, gradually advancing to radar associate controller and then radar controller. Failure to become certified in any position at a facility within a specified time may result in dismissal. Controllers who fail to complete either the academy or the on-the-job portion of the training are dismissed. Controllers must pass a physical examination each year and a job performance examination twice each year.

Controllers can transfer to jobs at different locations or advance to supervisory positions, including management or staff jobs in air traffic control and top administrative jobs in the FAA.

Job Outlook

Competition for air traffic controller jobs is expected to remain keen through the mid-1990's because the occupation's relatively high pay and liberal retirement program attract many more qualified applicants than the number of job openings. College graduates or individuals who have civilian or military experience as controllers, pilots, or navigators will have the best employment opportunities.

Employment of air traffic controllers is expected to show little or no change through the mid-1990's. Despite the increase in the number of aircraft flying, few, if any, additional air traffic controllers will be needed because of the greater use of new, automated control equipment. Virtually all job openings will arise from the need to replace experienced controllers who transfer to other occupations, retire, die, or stop working for other reasons.

Air traffic controllers who continue to meet the proficiency and medical requirements enjoy more job security than most workers. The demand for air travel and the workloads of air traffic controllers decline during recessions, but controllers seldom are laid off.

Earnings

Air traffic controllers who started with the FAA in 1985 earned about $17,800 (grade 7) a year. Controllers at the grade 9 level and above earn 5 percent more than other Federal workers in an equivalent grade. A controller's pay is determined by both the worker's job responsibilities and the location of the particular facility. Earnings are higher at facilities where traffic patterns are more complex. In 1984, controllers averaged $35,400 a year.

Depending on length of service, they receive 13 to 26 days of paid vacation and 13 days of paid sick leave each year, life insurance, and health benefits. In addition, controllers can retire at an earlier age and with fewer years of service than other Federal employees.

Related Occupations

Other occupations which involve the direction and control of traffic in air transportation are airline-radio operator and airplane dispatcher.

Sources of Additional Information

A pamphlet providing general information about controllers and instructions for submitting an application is available from any U.S. Office of Personnel Management Job Information Center. Look under U.S. Government, Office of Personnel Management, in your telephone book to obtain a local Job Information Center telephone number and call for a copy of the Air Traffic Controller Announcement. If there is no listing in your telephone book, dial the toll-free number 800-555-1212 and request the number of the Office of Personnel Management Job Information Center for your location.

Broadcast Technicians

(D.O.T. 193.167-014, 262-018, and -038; 194.262-010, .282-010, .362-010 and -018)

Nature of the Work

Broadcast technicians operate and maintain the electronic equipment used to record and transmit radio and television programs. They work with microphones, sound and video tape recorders, light and sound effects, television cameras, transmitters, and other equipment.

In the control room of the radio or television broadcasting studio, these technicians operate equipment that regulates the signal strength, clarity, and range of sounds and colors in the material being recorded or broadcast. They also operate control panels that select the source of the material being broadcast. Technicians may switch from one camera or studio to another, from film to live programming, or from network to local programs. By means of hand signals and, in television, by use of telephone headsets, they give technical directions to personnel in the studio.

When events outside the studio are to be broadcast, technicians go to the site and set up, test, and operate the remote equipment. After the broadcast, they dismantle the equipment and return it to the station.

As a rule, broadcast technicians in small stations perform a variety of duties. In large stations and at networks, on the other hand, technicians are more specialized, although specific job assignments may change from day to day. *Transmitter operators* monitor and log outgoing signals and are responsible for operating the transmitter. *Maintenance technicians* set up, adjust, service, and repair electronic broadcasting equipment. *Audio control engineers* regulate sound pickup, transmission, and switching, and *video control engineers* regulate the quality, brightness, and contrast of television pictures. *Recording engineers* operate and maintain video and sound recording equipment. Some technicians operate equipment designed to produce special effects, such as the illusions of a bolt of lightning or the sound of a police siren. When programs originate outside the studio, *field technicians* set up and operate broadcasting equipment. Television news coverage requires so much electronic equipment that a growing number of stations now assign technicians to work exclusively in news operations. The terms "operator," "engineer," and "technician" often are used interchangeably in describing these jobs.

Supervisory personnel with job titles such as *chief engineer* or *transmission engineer* direct activities concerned with the operation and maintenance of studio broadcasting equipment.

Working Conditions

Broadcast technicians generally work indoors in pleasant surroundings. Stations are air-conditioned because transmitters and other electronic equipment must be operated at cool temperatures. Broadcasts outside the studio, however, may require technicians to work out of doors under less favorable conditions. Technicians doing maintenance work may climb poles or antenna towers. Setting up equipment requires some heavy lifting.

Network technicians may occasionally have to work long hours under great pressure to meet broadcast deadlines. As more television stations broadcast program 24 hours a day, more technicians are required to work one of three shifts—days, evenings, or nights.

Employment

Broadcast technicians held about 25,000 jobs in radio and television stations in 1984. Television stations employ, on the average, many more technicians than radio stations. Although broadcast technicians are employed in every State, most are located in large metropolitan areas. The highest paying and most specialized jobs are concentrated in New York City, Los Angeles, and Washington, D.C.—the originating centers for most of the network programs.

Training, Other Qualifications, and Advancement

Federal law requires that anyone who operates broadcast transmitters in radio and television stations must have a restricted radiotelephone operator permit, for which no examination is required. Persons who work with microwave or other internal radio communications equipment, however, must have a general radiotelephone operator license, issued after the applicant passes a series of written examinations. These cover communications law and regulations, radio operating practices, and basic communications electronics.

Technical school, community college, or college training in engineering or electronics is the best way to prepare for a broadcast technician job, particularly for those who hope to advance to supervisory positions or to the more specialized jobs in large stations and in the networks. Because most broadcast equipment contains microprocessors and other sophisticated electronics, it is becoming more important for technicians to have high school courses in algebra, trigonometry, physics, electronics, and other

Broadcast technicians give technical directions to personnel in the studio.

sciences. Building electronic hobby kits and operating a "ham" or amateur radio also are good introductions to broadcasting technology. Some persons gain work experience as temporary employees while filling in for regular broadcast technicians who are on vacation, and some gain experience in college campus radio and television stations.

Broadcast technicians must have an aptitude for working with electrical and mechanical systems and equipment. Manual dexterity—the ability to perform tasks requiring precise, coordinated hand movements—is necessary for success in this occupation.

Entry level workers are instructed and supervised by the chief engineer, or by other experienced technicians, concerning the work procedures of the station. They generally begin their careers in small stations, operating the transmitter and handling other technical duties after a brief instruction period. As they acquire more experience and skill, they are assigned to more responsible jobs. Those who demonstrate above-average ability may move into top level technical positions such as supervisory technician or chief engineer. A college degree in engineering is becoming increasingly important for advancement to supervisory and executive positions.

Job Outlook

People seeking beginning jobs as broadcast technicians are expected to face strong competition in major metropolitan areas, where the number of qualified jobseekers greatly exceeds the number of openings. As is the case with other occupations in radio and television broadcasting, stations in major metropolitan areas seek highly experienced personnel to fill broadcast technician jobs. Prospects for entry level positions generally are good in small cities for people with appropriate training in electronics.

Employment of broadcast technicians is expected to increase faster than average for all occupations through the mid-1990's. New job opportunities for technicians will arise as new commercial radio and television stations go on the air, established stations increase their broadcasting hours, and the number of cable television systems continues to increase. However, demand for broadcast technicians may not keep pace with the increase in broadcasting industry employment because of laborsaving technical advances such as computer-controlled programming and remote control of transmitters. Technological developments such as these have shifted the emphasis from operations to maintenance work, which frequently is performed by service personnel employed by broadcasting equipment manufacturers. Most job openings will result from the need to replace experienced technicians who retire, die, or transfer to other occupations.

Earnings

Median weekly earnings of full-time broadcast technicians were about $330 in 1984. The middle 50 percent earned between $230 and $550 weekly; the lowest 10 percent earned less than $190; and the top 10 percent earned more than $1,000.

In 1984, average earnings for technicians at radio stations were $300 a week, according to a survey conducted by the National Association of Broadcasters. In television, earnings were somewhat higher, about $350 a week. As a rule, technician wages are highest in large cities and large stations. Technicians in the largest stations earned, on the average, about twice as much as those in the smallest stations. Earnings of experienced technicians were much higher, and technicians who can perform the full range of tasks are, of course, the highest paid. Television stations usually pay higher salaries than radio stations because television work is generally more complex. Technicians employed by educational broadcasting stations generally earn less than those who work for commercial stations.

Most technicians in large stations work a 40-hour week with overtime pay for additional hours. Broadcast technicians in small stations generally work a considerable amount of overtime. Evening, night, and weekend work frequently is necessary since most stations are on the air 18-24 hours a day, 7 days a week.

Related Occupations

Broadcast technicians need electronics training and eye-hand coordination to operate technical equipment; they generally complete specialized postsecondary programs, including courses in electronics and engineering. Others whose jobs have similar requirements include drafters, engineering and science technicians, surveyors, air traffic controllers, radiologic technologists, respiratory therapy workers, electrocardiograph technicians, electroencephalographic technicians, and medical laboratory technicians.

Sources of Additional Information

For information about the general radiotelephone operator license, write to:

Federal Communications Commission, 1919 M St. NW., Washington, D.C. 20554.

For information on careers for broadcast technicians, write to:

National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

National Cable Television Association, 1724 Massachusetts Ave. NW., Washington, D.C. 20036.

For a list of schools that offer programs or courses in broadcasting, contact:

Broadcast Education Association, National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

Computer Programmers

(D.O.T. 020.162-014, .167-018, -022, .187-010, and .262)

Nature of the Work

Computers can process vast quantities of information rapidly and accurately, but only if they are correctly programmed. Computer programmers write the detailed instructions (called programs or software) that list in a logical order the steps the machine must follow to organize data, solve a problem, or do some other task.

Programmers often work from descriptions prepared by systems analysts who have carefully studied the task that the computer system is going to perform—perhaps organizing data collected in a survey or estimating the stress on portions of a building during a hurricane. These descriptions contain a detailed list of the steps the computer must follow, such as retrieving data stored on a tape or disk, organizing it in a certain way, and performing the necessary calculations. (A more detailed description of the work of systems analysts is presented elsewhere in the *Handbook*.)

Some organizations, particularly smaller ones, do not employ systems analysts. Instead, workers called programmer-analysts are responsible for both systems analysis and programming. A programmer writes the specific program for the problem by breaking down each step into a series of instructions coded in one of the languages, such as BASIC or COBOL, developed especially for computers.

Programmers developing instructions for billing customers, for example, would first take the appropriate company records and then specify a solution by showing the steps the computer must follow to obtain old balances, add new charges, deduct payments, and calculate finance charges and the new amount due. Programmers then code the actual instructions the computer will follow in a programming language, such as COBOL, which is commonly used for business applications. They also insert comments in the coded instructions so other programmers can understand the program.

Next, programmers test the operation of the program to be sure the instructions are correct and will produce the desired information. Programmers prepare sample data that will test every part of the program and review the results to see if any errors were made. If errors did occur, the program must be changed and rechecked until it produces the correct results. This is called "debugging" the program.

Finally, programmers prepare an instruction sheet for the computer operator who will run the program. (The work of computer operators is described in the statement on computer equipment operators.)

Programs vary with the type of problem to be solved. For example, the arithmetical calculations involved in payroll accounting procedures are different from the mathematical calculations required to determine the flight path of the Space Shuttle. Although simple programs can be written in a few hours, programs that use complex mathematical formulas or many data files may require more than a year of work. In some cases, several programmers may work together in teams under a senior programmer's supervision.

Programmers often are grouped into two broad types: Applications programmers and systems programmers. Applications programmers are usually oriented toward business, engineering, or science. They write software to handle specific jobs, such as a program used in an inventory control system or one to control the temperature in an entire office building. Systems programmers, on the other hand, maintain the software that controls the operation of the entire computer system. These workers make changes in the sets of instructions that determine how the central processing unit of the computer handles the various jobs it has been given and communicates with peripheral equipment, such as terminals, printers, and disk drives. Because of their knowledge of entire computer systems, systems programmers often help applications programmers determine the source of problems that may occur with their programs.

Working Conditions

Programmers work in offices in comfortable surroundings. They usually work about 40 hours a week, but their hours are not always from 9 to 5. Programmers may report early or work late to use the computer when it is available; occasionally, they work on weekends to meet deadlines.

Employment

Computer programmers held about 341,000 jobs in 1984. Most are employed by manufacturing firms, data processing service organizations—including firms that write and sell software—government agencies, banks, insurance companies, and colleges and universities. Jobs for programmers are found throughout the country. Compared to the total labor force, a larger proportion of programmers work in the Northeast and West, reflecting the concentration of computer manufacturers and data processing service firms.

Applications programmers work for all types of firms that use computer systems. Systems programmers, on the other hand, usually work for organizations with large computer centers and for firms that manufacture computers or develop software.

Training, Other Qualifications, and Advancement

There are no universal training requirements for progammers because employers' needs vary. Computer programming is taught at public and private vocational schools, community and junior colleges, and universities. High schools in many parts of the country also offer introductory courses in data processing. Many programmers are college graduates; others have taken special courses in computer programming to supplement their

Computer programmers may have to adjust their work schedules to use the computer when it's available.

experience in fields such as accounting, inventory control, or other business areas. The level of education and quality of training that employers seek, however, has generally been rising due to the growth in the number of qualified applicants and the increasing complexity of some programming tasks.

Employers using computers for scientific or engineering applications prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences. Graduate degrees are required for some jobs.

Employers who use computers for business applications prefer to hire people who have had college courses in programming and business; however, a bachelor's degree is not required by all employers. Also, experience in accounting, inventory control, and other business skills generally is preferred by employers. Some employers promote workers such as computer operators who have taken courses in programming to programmer jobs because of their work experience.

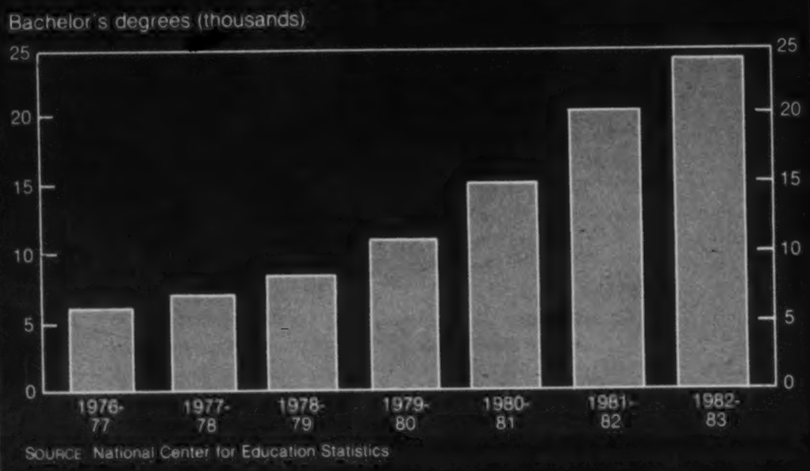
An indication of experience and professional competence at the senior programmer level is the Certificate in Computer Programming (CCP). This designation is conferred by the Institute for Certification of Computer Professionals upon candidates who have passed a basic five-part examination. In addition, individuals may take another section of the exam in order to specialize in business, science, or systems applications.

In hiring programmers, employers look for people who can think logically and are capable of exacting analytical work. The ability to work with abstract concepts and do technical analysis is especially important for systems programmers because they work with the software that controls the computer's operation. The job calls for patience, persistence, and the ability to work with extreme accuracy even under pressure. Ingenuity and imagination are particularly important when programmers must find new ways to solve a problem.

Beginning programmers may spend their first weeks on the job attending training classes. After this initial instruction, they work on simple assignments, such as maintaining existing programs. Programmers generally must spend at least several months working under close supervision. Because of rapidly changing technology, programmers must continue their training by taking courses offered by their employer and software vendors.

For skilled workers, the prospects for advancement are good. In large organizations, they may be promoted to lead programmers and be given supervisory responsibilities. Some applications programmers become systems programmers after they gain experience and take courses in system software. Both applications programmers and systems programmers may become systems analysts or be promoted to managerial positions.

The number of college graduates in computer and information science has risen sharply.



SOURCE: National Center for Education Statistics

Job Outlook

Employment of programmers is expected to grow much faster than the average for all occupations through the mid-1990's as computer usage expands. The need for applications programmers will increase as businesses, government, schools, and scientific organizations seek new applications for computers and improve the software already in use. Employment, however, is not expected to grow as rapidly as in the past as improved software and programming techniques simplify or eliminate some programming tasks. The greater use of packaged software that can meet the needs of many users also may moderate the growth in demand for applications programmers. More systems programmers will be needed to develop and maintain the complex operating programs that allow the use of higher level computer languages, and the networking of computer equipment and systems.

In addition to jobs resulting from increased demand for programmers, many openings will arise each year from the need to replace workers who leave the occupation. Although the proportion of programmers leaving the occupation each year is smaller than in most occupations, most of the job openings for programmers will result from replacement needs. Most of the programmers who leave the occupation transfer to other occupations, such as manager or systems analyst.

Job prospects should be best for college graduates who are familiar with a variety of programming languages, particularly newer languages that apply to computer networking and data base management. Participation in a work-study program or training in an applied field such as accounting, management, engineering, or science also will improve prospects for college graduates seeking entry level jobs.

Graduates of 2-year programs in data processing and people with less than a 2-year degree or its equivalent in work experience will face competition. The rapid growth of employment opportunities in this occupation has led to substantial increases in the number of courses in programming being offered by postsecondary schools, junior colleges, and 4-year colleges and, consequently, in the number of people seeking jobs. As the number and quality of applicants have increased, employers have become more selective. Because shorter curriculums may offer limited training in applied fields and some aspects of programming, graduates of those curriculums are expected to have more difficulty finding jobs than in the past.

Earnings

Median earnings of programmers who worked full time in 1984 were about $500 a week. The middle 50 percent earned between $380 and $630 a week. The lowest 10 percent earned less than $285 a week, the highest 10 percent more than $780.

Average earnings of beginning programmers in private industry were about $385 a week in 1984, according to a survey conducted in urban areas by the Bureau of Labor Statistics. Experienced programmers earned about $475 a week. Weekly salaries for lead programmers were about $575. In the Federal Government, the entrance salary for programmers with a college degree was about $345 a week in early 1985.

Programmers working in the North and West earned somewhat more than those working in the South. Those working in manufacturing and public utilities had higher earnings than programmers employed in other industries. On average, systems programmers earn more than applications programmers.

Related Occupations

Other workers in mathematics, business, and science who solve detailed problems include systems analysts, mathematical statisticians, engineers, financial analysts, actuaries, mathematical technicians, and operations research analysts.

Sources of Additional Information

Additional information about the occupation of programmer is available from:

Data Processing Management Association, 505 Busse Hwy, Chicago, Ill. 60068.

Legal Assistants

(D.O.T. 119.267-022 and -026)

Nature of the Work

Not all legal work requires a lawyer's expertise. In recent years, lawyers have increasingly used legal assistants—also called "paralegals" or "legal technicians"—to provide legal services to more persons at less cost.

Legal assistants work directly under the supervision of a lawyer. While the lawyer assumes responsibility for the legal assistant's work, a legal assistant is often allowed to perform all the functions of a lawyer other than accepting clients, setting legal fees, giving legal advice, or presenting a case in court.

Legal assistants generally do background work for the lawyer. To help a lawyer prepare a case for trial, a legal assistant investigates the facts of the case to make sure that all relevant information is uncovered. The legal assistant conducts research to identify the appropriate laws, judicial decisions, legal articles, and other material that will be used to determine whether the client has a good case or not. After analyzing all the information, the legal assistant prepares a written report that is used by the attorney to decide how the case should be handled. If the attorney decides to bring a lawsuit for the client, the legal assistant may prepare legal arguments, draft pleadings to be filed with the court, obtain affidavits, and assist the attorney during the trial. The legal assistant also may keep files of all documents and correspondence important to the case.

Besides trial-related work, legal assistants may help draft documents such as contracts, mortgages, separation agreements, and trust instruments. They may help prepare tax returns and plan estates. Some legal assistants coordinate the activities of law office employees and keep the financial records for the office.

Legal assistants who work for corporations help attorneys handle corporate matters such as employee contracts, shareholder agreements, stock option plans, and employee benefit plans. They may help prepare and file annual financial reports and secure loans for the corporation. Legal assistants also review government regulations to make sure that the corporation operates within the law.

The duties of legal assistants who work in government vary depending on the type of agency that employs them. Generally, legal assistants in government analyze legal material for internal use, maintain reference files, conduct research for attorneys, collect and analyze evidence for agency hearings, and prepare informative or explanatory material on the law, agency regulations, and agency policy for general use by the agency and the public.

Legal assistants employed in community legal service projects help the poor, the aged, and other persons in need of legal aid. They file forms, conduct research, and prepare documents. When authorized by law, they may represent clients at administrative hearings.

Some legal assistants, usually those in small and medium-sized law firms, have varied duties. One day the legal assistant may do research on judicial decisions on improper police arrests and the next day may help prepare a mortgage contract. This requires a general knowledge of many areas of the law.

Most legal assistants work for large, departmentalized law firms, government agencies, and corporations and specialize in one area of the law. Some specialties are real estate, estate planning, family law, labor law, litigation, and corporate law. Even within specialties, functions often are broken down further so that a legal assistant deals with one narrow area of the specialty. For example, legal assistants who specialize in labor law may deal exclusively with employee benefits.

A growing number of legal assistants are using computers in their work. Computer software packages are increasingly used to search legal literature stored in the computer and identify legal texts relevant to a specific subject. In litigation that involves many supporting documents, legal assistants may use computers to organize and index the material. Legal assistants may also use computer software packages to perform tax computations and explore the consequences of possible tax strategies for clients.

Working Conditions

Legal assistants do most of their work at desks in offices and law libraries. Occasionally, they travel to gather information and perform other duties. They may work alone or with others.

Most legal assistants work a standard 40-hour week. Sometimes, they work very long hours and are under pressure to meet deadlines. They usually do not get paid for overtime work, although they may receive compensatory time off.

Legal assistants handle many rou-

To help lawyers prepare a case, legal assistants do research on relevant laws and judicial decisions.

tine assignments. Some find that these assignments offer little challenge and become frustrated with their duties. On the other hand, many lawyers assign more responsible tasks as the legal assistant gains experience. Furthermore, as new laws and judicial interpretations emerge, legal assistants are exposed to many new legal problems that make their work more interesting and challenging.

Employment

Legal assistants held nearly 53,000 jobs in 1984; private law firms employed the majority. Legal assistants are found in nearly every Federal Government agency; the Departments of Justice, Treasury, Interior, and Health and Human Services and the General Services Administration are the largest employers. State and local governments and publicly funded legal service projects also employ legal assistants. Banks, real estate development companies, insurance companies, accounting firms, management consulting firms, manufacturing firms, and other corporate offices hire legal assistants.

Training, Other Qualifications, and Advancement

There are several ways to enter the legal assistant profession. Increasingly, employers require formal legal assistant training. However, some employers prefer to train their legal assistants on the job. Entrants to this occupation include legal secretaries and high school and college graduates with no legal experience. Other entrants have experience in a technical field that is useful to law firms, such as a background in tax preparation for tax and estate practice or nursing or health administration for personal injury practice.

Several hundred formal programs in legal assistance are available from 4-year colleges and universities, law schools, community and junior colleges, business schools, proprietary schools, legal assistant associations, and a few law firms. In 1984, about 80 programs had been approved by the American Bar Association (ABA); approval by the ABA is not required and many programs do not seek it. The requirements for admission to formal training programs vary widely. Some require some college courses or a bachelor's degree. Others accept high school graduates or persons with legal experience. A few schools require standardized tests and personal interviews.

Most legal assistant programs are completed in 2 years, although some take as long as 4 years and others only a few months. Some schools offer general legal assistant training with courses in many different areas of the law, including legal research techniques. Others provide training in specialized areas of the law, such as real estate, estate planning and probate, litigation, family law, contracts, criminal law, and income taxation. Many employers prefer applicants with training in a specialized area of the law. Many legal assistant training programs include an internship in which students gain practical experience by working in a law office, corporate legal department, or government agency. Depending on the program, graduates may receive a certificate, an associate degree, or, in some cases, a bachelor's degree in legal assistance.

The quality of legal assistant training programs varies; the better programs generally emphasize job placement. Prospective students should examine the experiences of recent graduates of programs in which they are considering enrolling.

Currently, legal assistants need not be certified. The National Association of Legal Assistants, however, has established standards for voluntary certification which require various combinations of education and experience. Legal assistants who meet these standards are eligible to take a 2-day examination given by the Certifying Board of Legal Assistants each year at several regional testing centers. Persons who pass this examination may use the designation Certified Legal Assistant (CLA). This designation is a sign of competence in the field and enhances one's employment and advancement opportunities.

Legal assistants must be able to handle legal problems logically and effectively communicate (both orally and in writing) their findings and opinions to their supervising attorney. They must understand legal terminology and have good research and investigative skills. Familiarity with the operation and applications of computers in legal research is increasingly important. Legal assistants must always stay abreast of new developments in the law that affect their duties.

Because legal assistants often deal with the public and other employees, they must be courteous and uphold the high ethical standards of the legal profession. A few States have established ethical guidelines that legal assistants in the State must follow.

Experienced legal assistants usually

are given progressively more responsible duties and less supervision. In large law firms, corporate legal departments, and government agencies, experienced legal assistants may supervise other legal assistants and delegate work assigned by the attorneys. While advancement opportunities usually are limited, a few legal assistants are promoted to managerial positions.

Job Outlook

The number of job openings for legal assistants is expected to increase significantly through the mid-1990's, but so will the number of persons pursuing this career. Thus, competition for jobs should increase as the number of graduates from legal assistant training programs rises. Still, job prospects are expected to be good for graduates of highly regarded formal programs.

Employment of legal assistants has grown tremendously since the emergence of this occupation in the late 1960's. Employment is expected to continue to grow much faster than the average for all occupations through the mid-1990's. The emphasis on hiring legal assistants should continue in both legal and law-related fields so that the cost, availability, and efficiency of legal services can be improved. Besides employment growth, numerous job openings are expected to arise as persons leave the occupation for various reasons.

Private law firms will continue to be the largest employers of legal assistants as a growing population sustains the need for legal services. The growth of prepaid legal plans also should contribute to the demand for the services of law firms. Other organizations, such as corporate legal departments, insurance companies, real estate and title insurance firms, and banks will continue to hire legal assistants. Job opportunities are expected to expand throughout the private sector as companies become aware of the value of legal assistants.

Job opportunities for legal assistants will expand even in the public sector. Community legal service programs provide assistance to the poor, the aged, minorities, and middle-income families. Because these programs operate on limited budgets, legal assistants will be used to keep expenses down without having to limit services. Federal, State, and local government agencies, consumer organizations, and the courts also should continue to hire legal assistants in increasing numbers.

To a limited extent, legal assistant jobs are affected by the business cycle. During recessions, the demand for some discretionary legal services, such as planning estates, drafting wills, and handling real estate transactions, declines. Corporations are less inclined to initiate litigation when falling sales and profits lead to fiscal belt tightening. As a result, legal assistants employed in offices adversely affected by a recession may be laid off. On the other hand, during recessions, corporations and individuals face other legal problems, such as bankruptcies, foreclosures, and divorces, that require legal solutions. Furthermore, the continuous emergence of new laws and judicial interpretations creates new business for lawyers and legal assistants without regard to the business cycle.

Earnings

Earnings of legal assistants vary greatly. Salaries depend on the training and experience the legal assistant brings to the job, the type of employer, and the geographic location of the job. Generally, legal assistants who work for large law firms or in large metropolitan areas earn more than those who work for smaller firms or in less populated regions.

According to an American Bar Association survey, legal assistants had an average starting salary of $14,400 in 1984. Top salaries of legal assistants averaged $20,500 in 1984, but many earned annual salaries of $25,000 or more.

Legal assistants hired by the Federal Government in 1985 started at $14,400 or $17,800 a year, depending on their training and experience. The average annual salary of legal assistants who worked for the Federal Government in 1984 was about $27,700.

Related Occupations

Several other occupations also call for a specialized understanding of the law and the legal system but do not require the extensive training of a lawyer. Some of these are abstractors, claim examiners, compliance and enforcement inspectors, occupational safety and health workers, patent agents, police officers, and title examiners.

Sources of Additional Information

General information on a career as a legal assistant and a list of legal assistant schools approved by the American Bar Association are available from:

Standing Committee on Legal Assistants, American Bar Association, 750 North Lake Shore Dr., Chicago, Ill. 60611.

For information on certification of legal assistants and schools that offer training programs in a specific State, contact:

National Association of Legal Assistants, Inc., 1420 South Utica, Tulsa, Okla. 74104.

Information on local training programs and job prospects is available from your local legal assistant association. A list of these associations can be obtained from:

National Federation of Paralegal Associations, Inc., P.O. Box 40158, Overland Park, Kan. 66204.

Library Technicians

(D.O.T. 100.367-018)

Nature of the Work

Library technicians perform many support activities needed to operate a library. They help professional librarians acquire, organize, and make material accessible to users. Like librarians, library technicians work either in technical or user services. Those in user services help people find information. Those in technical services acquire and prepare materials for use and deal less frequently with the public.

Library technicians are also known as *library technical assistants*. They answer questions about use of the card catalog, direct library users to standard references, perform routine cataloging of library materials, file cards in catalog drawers, verify information on order requests, and may supervise other support staff. Some library technicians operate and maintain audiovisual equipment such as projectors and tape recorders. They may also assist library users with microfilm or microfiche readers, or retrieve information from a computer data base. Technicians sometimes work on special projects. A technician with artistic ability, for example, might design posters and displays.

Working Conditions

Library technicians work with people, books, audiovisual materials, and me-

Library technician uses microfiche reader to retrieve information.

chanical equipment. At times, their jobs may be very repetitive—when calculating circulation statistics, for example. At other times, however, they may work on special projects such as designing posters and setting up displays. The job may require much standing, stooping, bending, lifting, and reaching. Library technicians in schools work regular school hours. Those in public libraries and college and university libraries may work weekend and evening hours. Library technicians in government and other special libraries—such as those in businesses, law firms, and research centers—usually work a regular 40-hour week.

Employment

Library technicians held about 42,000 jobs in 1984. Most worked in school, academic, or public libraries.

The Federal Government employed about 2,800 library technicians. Most worked in Department of Defense libraries or in the Library of Congress.

Training, Other Qualifications, and Advancement

Although some individuals with a high school education may find jobs as library technicians, most employers prefer people with at least some college training. Post-high school education has become increasingly necessary as libraries with tight budgets seek technically trained individuals who are able to assume greater responsibilities and as the number of people with college training seeking library technician jobs has increased.

Some library technicians are trained on the job. However, libraries encourage support staff members to take courses in library technology to improve their job skills.

Two-year colleges offer training for library technicians. Junior and community college programs leading to an associate of arts degree in library technology include 1 year of liberal arts courses and 1 year of library-related study. Students study the purposes and organization of libraries and how they operate. They learn to order, process, catalog, and circulate library materials. Some receive training in library automation. Many learn to produce audiovisual materials such as posters, transparencies, and audio and video tapes and to use and maintain audiovisual equipment. Credits earned for an associate degree in library technology do not apply toward a professional degree in library science.

Job Outlook

Employment of library technicians is expected to grow more slowly than the average for all occupations through the mid-1990's. However, many library technicians will be needed annually to replace those who transfer to other fields, retire, or die.

Continued employment growth is expected in special libraries such as business, government, and law libraries. Slow growth is expected in school libraries, reflecting rapid enrollment increases in elementary schools but little change in secondary schools. Some growth also may result as technicians increasingly perform routine tasks formerly done by librarians. Employment is expected to decline in academic libraries because of declining college enrollments. Employment in public libraries is likely to grow slowly, as is government employment in general.

Earnings

Salaries for library technicians vary widely, depending on the size of the library or library system as well as the geographic location and size of the community.

Salaries of library technicians in the Federal Government averaged $16,895 in 1984.

Related Occupations

Library technicians keep records; catalog, sort, and shelve materials; and assist people seeking information. Workers in other occupations with similar duties include records management technicians, information specialists, data processing control clerks, medical records technicians, title searchers, insurance claims clerks, reservation clerks, secretaries, mail clerks, records custodians, and teacher aides.

Sources of Additional Information

Information about a career as a library technician and a directory of schools offering training programs in this field can be obtained from:

Council on Library/Media Technicians, Cuyahoga Community College, Attention Margaret R. Barron, 2900 Community College Ave., Cleveland, Ohio 44115.

For information on training programs for library-media technical assistants, write:

American Library Association, Office for Library Personnel Resources, 50 East Huron St., Chicago, Ill. 60611.

Tool Programmers, Numerical Control

(D.O.T 007.167-018)

Nature of the Work

Aircraft, industrial machinery, medical and scientific instruments, and many other durable goods require precision-machined metal parts. Most of these parts are made with machine tools—drill presses, lathes, milling machines, and others. A growing number of machine tools are numerically controlled. These have two components: An electronic controller and the machine tool itself. The controller "reads" a program—a coded list of the steps necessary to perform a specific machining job—and runs the machine tool's mechanisms through the steps. The efficient operation of these machine tools depends, in large part, on the skill of tool programmers, who write the programs.

Tool programmers must have a broad knowledge of machining operations, mathematics, and blueprint reading. They must know how various machine tools operate and the working properties of the metals and plastics used to make parts. Because the various brands and models of numerically controlled machine tools use different programming languages, tool programmers must know the languages for each of the machines they work with.

Programmers begin the task of writing a program by analyzing the blueprints of the item to be made by the machine. They then determine the sequence of machine operations and select the proper cutting tools needed to machine the workpiece into the desired shape. For simple jobs, they manually compute the size and position of the cuts that must be made on the workpiece, and also calculate the machine speed and feed rate needed for the type of material being machined. They then write the program in the language of the machine's controller and put it on a storage medium such as punch tape, magnetic tape, or disc.

For most jobs, programmers use computers to write the program for the machine controller. Using computer languages called general processors, programmers can write the program for a controller as a series of simple commands. The computer does the mathematics and uses programs called post processors to translate the general processor program into the language of the controller and store it on tape or disc. A growing number of firms have computer-aided design (CAD) systems that programmers can use to write the program for the controller. When a part is designed using a CAD system, data about its dimensions are calculated. In a CAD system with the proper software, the tool programmer can use these data to develop the controller's program. Tool programmers do not write or maintain the general or post processors and CAD software; they only use them as aids in their work.

Programmers also write an instruction list to help the machine operator set up and tend the machine. Finally, programmers may watch the operation of a trial run of the machine to insure that it is functioning properly and check the output to be sure the specifications are met. Computer simulations may be used instead of a trial run to check the program.

Working Conditions

Tool programmers work in comfortable surroundings. The rooms in which they work generally are separated from the areas where the machine tools are in use, so they are not exposed to machine noise. Their work generally is not as active as that of the workers who operate the machine tools.

Employment

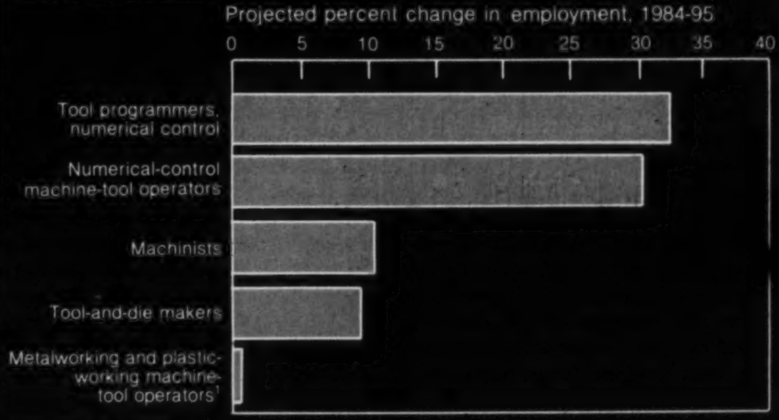
Tool programmers held about 11,000 jobs in 1984. Almost all work for manufacturing firms or small machining shops that produce durable goods such as aircraft, industrial machinery, and instruments. Most jobs for tool programmers are in large metropolitan areas where most factories and machine shops are located.

Tool programmers need a broad knowledge of machining operations, mathematics, and blueprint reading.

Training, Other Qualifications, and Advancement

Tool programmers learn their jobs through a combination of work experience and vocational study. Employers prefer to promote or hire skilled machinists or machine operators for programmer jobs. To learn programming, these experienced workers take courses at vocational schools or junior colleges; employers may pay for these courses. Because programming methods differ among the brands of numerically controlled machine tools,

Increased use of automated machine tools is expected to make tool programmers the fastest growing machining occupation.



[1] Less than 0.5 percent.

SOURCE: Bureau of Labor Statistics

manufacturers usually provide training in programming for employees of firms that purchase their machines. Although this is not generally considered an entry level job, some employers will hire people without machining experience if they have completed vocational school or junior college courses in tool programming and demonstrate the ability to learn machine operations. Those who have completed high school courses and have displayed ability in mathematics, blueprint reading, metalworking, data processing, physics, and drafting will have the best chance of landing a job.

Tool programmers can advance to supervisory jobs or transfer to skilled machining jobs such as tool designer.

Job Outlook

Employment of tool programmers is expected to increase much faster than the average for all occupations through the mid-1990's. Besides openings arising from growth in demand for these workers, many openings are expected to occur each year as programmers transfer to other fields of work, retire, or die. However, since this is a relatively small occupation, the total number of job openings will be much smaller than in other machining occupations such as metalworking machine operator, machinist, and tool-and-die maker.

As the economy grows, the demand for industrial machinery, aircraft, motor vehicles, and other products that use machined parts or tooling for molded parts will increase. In order to compete with foreign manufacturers of these goods, American firms are expected to increase sharply their use of numerical control and other types of automated machining equipment. This equipment will enable these firms to better control their costs and to machine parts and tooling to more exact specifications. As more firms install numerically controlled machine tools, the demand for tool programmers also will rise. However, this increase in demand will be limited by advances in the software used in tool programming. The link between computer-assisted design systems and machine controllers, for example, is expected to improve—making the writing of programs easier and quicker.

Earnings

In 1984, tool programmers earned about $12 an hour, according to a survey by the National Tooling and Machining Association. In comparison, the hourly rate for all production workers in private industry, except farming, was $8.33. Tool programmers generally work a 40-hour week; however, overtime is common during periods of high manufacturing activity.

Related Occupations

Tool programmers apply their knowledge of machining operations, blueprints, and machine programming to write programs that run machine tools. Other highly skilled workers involved in metal machining work are: Tool-and-die designers, tool planners, tool-and-die makers, and machinists.

Sources of Additional Information

For more information about this occupation, contact:

The National Machine Tool Builders, 7901 Westpark Dr., McLean, Va. 22102.

The National Tooling and Machining Association, 9300 Livingston Rd., Ft. Washington, Md. 20744.

The National Screw Machine Products Association, 6700 W. Snowville Rd., Breckville, Ohio 44141.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068.

Marketing and Sales Occupations

Sales work offers a wide range of career opportunities. In some sales jobs, people are their own bosses, set their own schedules, and have their earnings depend entirely upon their performance. Other jobs are more routine, with structured work schedules and guaranteed hourly wages. Supervisory positions in sales enable individuals to use their leadership and administrative abilities to plan, organize, and coordinate retail, wholesale, insurance, real estate, and other sales activities. In all kinds of sales work, opportunities are good for flexible or part-time working hours.

This section of the *Handbook* describes sales workers in retail trade, wholesale trade, manufacturing, insurance, real estate, and securities and financial services. Also discussed are travel agents and cashiers.

Training, Other Qualifications, and Advancement

Training requirements for sales work are as varied as the work itself. For jobs selling standardized merchandise such as magazines, candy, cigarettes, and cosmetics, employers usually seek high school graduates and have experienced sales workers train them on the job. In some large establishments, they may also attend training courses. Those who sell more complex products or services, such as electronic equipment or liability insurance, need substantial education and training. For some sales positions, employers recruit college graduates with majors in science or engineering. For other jobs, employers seek college graduates in the liberal arts, or individuals with comparable job experience, and train them on the job or in training programs. Many sales workers learn through years of on-the-job experience, often supplemented by home study, employer training, and college courses. For example, a real estate agent may take university extension courses; a department store beauty counselor may participate in an industry-sponsored training program; and a retail furniture sales worker may learn through years of observation and experience on the job, combined with visits to the factory to see how the furniture is made.

Even in the most routine kinds of selling, a high school diploma is an asset to a beginner. Courses in business, marketing, and merchandising are particularly useful. Many high schools have work-study programs that allow students to work part time in local businesses while attending classes in retailing. The proportion of sales workers who are college graduates has risen rapidly, from about 12 percent in 1970 to 26 percent in 1984. This is due in part to a need for more highly trained workers in some sales jobs. It also reflects the fact that many college graduates who were unable to secure a job in their field of study took jobs in retail sales.

Personal attributes are extremely important in sales occupations—more so than in many other jobs. Sales workers must be outgoing, enthusiastic, and persuasive. They have to be poised and at ease with strangers, and good at striking up a conversation and relating to other people. Success in sales takes initiative, energy, self-confidence, and self-discipline. Arithmetic skills are an asset. Sales workers often find their sales ability and product knowledge can be used in a variety of jobs. For example, a retail clothing sales worker may become a clothing manufacturer's sales representative.

Job Outlook

Employment in most sales occupations is expected to rise about as fast as or faster than the average for all occupations through the mid-1990's. In addition to jobs resulting from growth, millions of openings will occur each year as experienced workers transfer to other occupations, retire, or leave the labor force for other reasons.

Earnings

Earnings vary widely among occupations. For some jobs, such as sales clerks, earnings are usually low—many pay at or only a little above the minimum wage, $3.35 an hour in 1985. For others, such as wholesale and manufacturers' sales workers and insurance and securities and financial services sales workers, earnings can be as high as for professional workers such as accountants and engineers. Some sales workers receive a guaranteed salary plus a commission, a percentage of the sales they make. Others are paid only on a commission basis. In addition, retail sales workers often receive generous discounts when they buy merchandise from their store.

Cashiers

(D.O.T. 209.567-014; 211.362-010, .367, .462, .467, .482; 249.467; and 294.567)

Nature of the Work

Supermarkets, department stores, movie theaters, restaurants, and many other businesses employ cashiers to handle payments from customers. Most cashiers receive money, make change, fill out charge forms, and give receipts. The related occupation of bank teller is discussed elsewhere in the *Handbook*.

In addition to these duties, cashiers, depending on their place of employment, may do other work and have different job titles. Those employed in theaters, for example, often called *box office cashiers* or *ticket sellers*, operate ticket-dispensing machines and answer telephone inquiries. Some order clerks are employed by fast-food restaurants to take orders over the telephone or intercom systems. Other restaurant cashiers, sometimes called *cashier checkers*, may handle reservations for meals and special parties, type menus, or sell items at the candy and cigarette counter. In supermarkets and other self-service stores, cashiers known as *checkout clerks*, *checkers*, or *grocery clerks* wrap or bag purchases. They also may restock shelves and mark prices, rearrange displays of merchandise, and take inventory. In many offices, *agency* or *front-office cashiers* type, operate the switchboard, do bookkeeping, and act as receptionists. Some cashiers act as clerks for auctioneers, keeping track of bids and accepting payment for sales items.

Cashiers operate several types of machines. Scanners are increasingly being used in grocery stores. An optical or magnetic scanner transmits the code number (Universal Product Code) of each item to a computer. The computer reads the code which identifies the item and price, totals the items purchased, computes the sales tax, and prints out a receipt.

The use of sophisticated cash registers is not restricted to grocery stores, however. Cashiers in many establishments use cash registers that print the amount of the transaction on a paper tape. A rapidly growing number of cashiers operate electronic or computerized point-of-sale registers. Such registers are replacing less versatile, conventional models in many stores. Cashiers who work in hotels and hospitals use machines that record charges for telephone, medical, and other services and prepare itemized bills. Cashiers may also operate adding and change-dispensing machines.

Working Conditions

Most cashiers work indoors, often in small booths or behind counters located near store entrances. They may have to stand for long periods of time. In some cases, they are exposed to cold drafts in the winter and considerable heat during the summer.

Hours of work may vary depending on the needs of the employer. Cashiers in theaters, restaurants, and food stores often work during rush periods such as holidays, weekends, late afternoons, and evenings; many work part time or on split shifts. Full-time cashiers in supermarkets and other large retail stores usually work a 5-day, 40-hour week; however, they may work on weekends and have time off during the week.

Employment

Cashiers held about 1,902,000 jobs in 1984. Supermarkets and other food stores employed the largest number. Other retail establishments providing large numbers of jobs are department stores, drug stores, shoe stores, hardware stores, furniture stores, and gasoline service stations. Restaurants, hotels, theaters, schools, and hospitals also employ a large number of cashiers. Since cashiers are needed in businesses and organizations of all types and sizes, jobs are distributed much like the general population. The Federal Government employs a relatively small number, primarily in the Department of Defense, in clubs, cafeterias, and exchanges on military installations.

Opportunities for part-time work are very good—especially during peak business periods such as the Christmas shopping season or durng the summer months. More than one-half of all cashiers work part time.

Cashiers should enjoy dealing with the public.

Training, Other Qualifications, and Advancement

Cashier jobs tend to be entry level positions requiring little or no experience and little education. Although there are no specific educational requirements, employers prefer persons with a high school diploma. Courses in business arithmetic, bookkeeping, typing, and other business subjects are good preparation for cashier jobs. Training is offered as part of many public school vocational programs.

Cashier jobs attract individuals who want to gain work experience or to earn money while in school or while tending to household responsibilities. Typically, about one-half of all job openings are filled by persons who are 19 years or younger, and almost three-quarters are 24 years or younger. About 1 in 4 cashiers is a student. Relatively few transfer into this occupation from other jobs.

Many employers offer on-the-job training. In a small firm, the beginner is trained on the job by an experienced worker. In large firms, training programs often include classroom instruction in the use of electronic or computerized registers and in other phases of the work. Sometimes employers seek persons who have special skills or business experience, such as typing or selling. Many openings, especially full-time positions, are filled by promoting qualified part-time workers.

Persons who want to become cashiers should be able to do repetitious work accurately. They need finger dexterity, a high degree of eye-hand coordination, and an aptitude for working with figures. Because they meet the public, cashiers should be neat in appearance and able to deal tactfully and pleasantly with customers.

Promotion opportunities for cashiers tend to be limited. However, the job affords a good opportunity to learn an employer's business and so may serve as a steppingstone to a more responsible job, such as bookkeeper or manager. Cashiers working in chain stores and other large retail businesses, for example, may advance to department or store managers.

Job Outlook

More job openings are expected to be available for cashiers than for any other occupation through the mid-1990's. The occupation is large, and employment is expected to grow faster than the average for all occupations. Nevertheless, the vast majority of openings will occur as cashiers transfer to other occupations or leave the labor force. As is the case for other sales workers, the proportion of cashiers who leave the occupation each year is very high; about one-third of cashiers leave their jobs annually—more than one and one-half times the rate for all workers. Most who leave the labor force assume full-time household responsibilties or return to school. Cashiers also transfer to other jobs at a higher than average rate. Opportunities for part-time employment are expected to continue to be very good.

Despite projected faster than average growth, employment of cashiers will not keep pace with the expected increase in the volume of goods and services sold because the shift of retailers to self-service operations has just about run its course. Employment of cashiers grew rapidly in the 1970's and early 1980's as more and more retail establishments introduced centralized cashier operations. This greatly expanded job opportunities for cashiers at the expense of other sales occupations. Since most retail stores now have centralized cashiers, the rate of employment growth in this section can be expected to moderate. Growth in the number of eating and drinking places, particularly in fast-food chains, is expected to be particularly rapid, and this will greatly expand job opportunities for cashiers.

Earnings

Beginning cashiers often earn only the minimum wage. The minimum in establishments covered by Federal law was $3.35 an hour in 1984. In addition, minimum wages in many establishments are governed by State law. Where State minimums are higher, the establishment pays at least that rate. Cashiers earn wages ranging from the minimum to several times that amount. Median weekly earnings for full-time cashiers were about $170 in 1984. The middle 50 percent earned between $140 and $250; 10 percent earned below $120; and 10 percent earned above $350.

Wages for union cashiers are generally higher than those for nonunion cashiers. Experienced full-time cashiers who were members of the United Food and Commercial Workers International Union, to which many cashiers belong, earned average wages of $11.16 per hour in 1984; beginners averaged $4.99 per hour. Cashiers generally receive health insurance, annual and sick leave, pension benefits, and similar benefits available to other workers.

Related Occupations

Cashiers receive and pay money and keep account of such exchanges. Other workers with similar duties include bank tellers, ticket sellers, postal service clerks, toll collectors, and sales clerks.

Sources of Additional Information

Details about employment opportunities are available from local businesses and the local office of the State employment service.

Insurance Sales Workers

(D.O.T. 239.267 and 250.257)

Nature of the Work

Most people have their first contact with an insurance company through an insurance sales worker. These professionals help individuals or companies select the right policy for their needs. Insurance sales workers sell policies that provide individuals and businesses with financial protection against loss. They plan for the financial security of individuals, families, and businesses; advise about insurance protection for an automobile, home, business, or other property; prepare reports and maintain records; and help a policyholder obtain settlement of an insurance claim. Specialists in group policies may help an employer provide employees the opportunity to buy insurance through payroll deductions.

Insurance sales workers sell one or more of the three basic types of insurance: Life, property-liability (casualty), and health. Life insurance agents offer policies that pay survivors when a policyholder dies. Depending on the policyholder's circumstances, a life policy also can be designed to provide retirement income, funds for the education of children, or other benefits. (Life insurance sales workers are sometimes called life underwriters; see the statement on underwriters elsewhere in the *Handbook*.)

Casualty insurance sales workers sell policies that protect individuals and businesses from financial losses as a result of automobile accidents, fire or theft, or other losses. Casualty insurance can also cover workers' compensation, product liability, or medical malpractice. Many life and casualty insurance sales workers also

Sales workers must be able to communicate effectively with potential customers.

sell health insurance policies covering the costs of hospital and medical care or loss of income due to illness or injury.

An increasing number of insurance sales workers offer comprehensive financial planning services to their clients. As a result, many insurance sales workers are also licensed to sell securities, such as mutual fund shares or annuities.

Working Conditions

Insurance sales workers do a considerable amount of local travel to meet with clients. They generally arrange their own hours of work, and often schedule evening and weekend appointments for the convenience of clients. Many work more than 40 hours a week.

Employment

Insurance sales workers held about 371,000 jobs in 1984. Many work part time, especially beginners who have other jobs while they attempt to build up a clientele. About 1 sales worker in 3 is self-employed. While most sales workers specialize in life insurance, a growing number (called multiline sales workers) offer both life and casualty policies. The following tabulation presents the percent distribution of wage and salary jobs by category of insurance.

	Percent
Total	100
Insurance carriers	70
Life insurance	58
Fire, marine, and casualty insurance	8
Accident and health insurance and medical service plans	3
Other insurance carriers	1
Insurance agents, brokers, and services	28
Real estate	1
Combined real estate, insurance, loan, and law offices	1

Sales workers are employed in cities and towns throughout the country, but most work in or near large population centers. Some insurance sales workers are employed in the headquarters of insurance companies but most work out of local company offices or independent agencies.

Training, Other Qualifications, and Advancement

Although many employers prefer college graduates for jobs selling insurance, most hire high school graduates with potential or proven sales ability or those who have been successful in other types of work. In fact, most entrants have transferred from other occupations. Understandably, they tend to be older, on average, than entrants to other occupations.

Many colleges and universities offer courses in insurance, and some schools offer a bachelor's degree in insurance. College courses in finance, mathematics, accounting, economics, business law, government, and business administration enable the insurance sales worker to relate insurance to other personal finance problems and to economic conditions. Courses in psychology, sociology, and public speaking can prove useful in improving sales techniques. Increasingly, basic knowledge of computer science will be useful. College training may help the sales worker grasp the fundamentals and procedures of insurance selling more quickly.

All insurance sales workers must obtain a license in the State where they plan to sell insurance. In most States, licenses are issued only to applicants who pass written examinations covering insurance fundamentals and the State insurance laws. Sales workers who plan to sell mutual fund shares and other securities also must be licensed by the State. New sales workers usually receive training at the agencies where they work and frequently also at the insurance company's home office. Beginners sometimes attend company-sponsored classes to prepare for examinations. Others study on their own and accompany experienced sales workers when they call on prospective clients.

Sales workers can broaden their knowledge of the insurance business by taking courses at colleges and universities and attending institutes, conferences, and seminars sponsored by insurance organizations. The Life Underwriter Training Council (LUTC) awards a diploma in life insurance marketing to sales workers who successfully complete the Council's 2-year program. This program emphasizes practical selling skills. There also are courses in health insurance and advanced sales techniques. The National Association of Health Underwriters awards the Registered Health Underwriter (RHU) designation to those individuals who successfully complete a series of courses. Life insurance sales workers can qualify for the Chartered Life Underwriter (CLU) designation by passing a series of examinations given by the American College of Bryn Mawr, Pa. Insurance sales workers who are interested in financial planning can earn the Certified Financial Planning (CFP) designation from the College of Certified Financial Planning in Denver, Colo., or the Chartered Financial Consultant (ChFC) designation from the American College of Bryn Mawr, Pa. Both designations reflect knowledge of tax laws, estate planning, investments, and other subjects. Casualty insurance sales workers can qualify for the Chartered Property Casualty Underwriter (CPCU) designation by passing a series of examinations given by the American Institute for Property and Liability Underwriters. These designations, RHU, CLU, CFP, ChFC, and CPCU, are recognized marks of achievement in their respective fields. Sales workers can qualify for another designation, Accredited Advisors in Insurance, by passing a series of three 1-semester courses covering principles of insurance production, multiline sales, and agency operation and marketing.

A growing number of States have mandatory continuing education requirements.

Insurance sales workers should be enthusiastic, self-confident, disciplined, hard working, and able to communicate effectively. They should be able to inspire customer confidence. Some companies give personality tests to prospective employees because personality attributes are important in sales work. Since they usually work without supervision, sales workers must be able to plan their time well and have initiative to locate new clients.

An insurance sales worker who shows sales ability and leadership may become a sales manager in a local office. A few advance to agency superintendent or executive positions. However, many who have built up a good clientele prefer to remain in sales work. Some, particularly in the casualty field, establish their own independent agencies or brokerage firms.

Job Outlook

Employment of insurance sales workers is expected to grow more slowly than the average for all occupations through the mid-1990's. While the volume of insurance sales may continue to expand, increasing productivity among insurance sales workers and changing business practices are expected to limit growth of insurance sales jobs. Most job openings are expected to result from the need to replace sales workers who leave the occupation. Turnover is high because many beginners are unable to establish a sufficiently large clientele in this highly competitive business. Opportunities should be best for ambitious people who enjoy sales work and who develop expertise in a wide range of insurance and financial services.

Future demand for sales workers depends on the volume of insurance sales. The volume of life and health insurance should increase rapidly over the next decade as many more workers enter the 25-54 age group. People in this group have the greatest need for life and health insurance, and for protection for homes, automobiles, and other valuables. Life insurance sales also should grow as more families seek policies designed to provide retirement income and educational funds for their children. Working women's growing need for life insurance and disability protection should increase insurance sales. Rising incomes as well as a concern for financial security also may stimulate sales of mutual funds, variable annuities, and other financial products and services. Sales of casualty insurance should rise as more people seek coverage not only for their homes and cars but also for expensive, advanced technology products such as home computers and video recorders, and as complex types of commercial coverage, such as product liability, workers' compensation, prepaid legal, kidnap, and pollution liability insurance are expanded.

Employment of sales workers will not keep pace with the rising level of insurance sales because more policies will be sold to groups and by mail and telephone. In addition, each sales worker should be able to handle more business as computers take over more routine clerical tasks. The trend toward multiline sales workers also will cause employment to rise more slowly than the volume of insurance sales. Firms outside the insurance industry—such as department stores—will increasingly offer various financial services, including insurance, using relatively few sales workers. In addition, large firms may increasingly hire risk managers to analyze their insurance needs and select the best policies.

Most individuals and businesses consider insurance a necessity, regardless of economic conditions. Therefore, sales workers are not likely to face unemployment because of a recession.

Earnings

Beginners in this occupation often are guaranteed a moderate salary while they learn the business and build a clientele. In 1984, many large companies paid new sales workers a median salary of about $1,200 a month during this training period, which usually lasts about 6 months. They usually subsidize their sales workers at the training period level for about 30 months providing they meet established goals. Thereafter, most sales workers are paid on a commission basis. The size of the commission depends on the type and amount of insurance sold, and whether the transaction is a new policy or a renewal. Life insurance sales workers with 5 to 10 years of experience had a median income of about $35,000 in 1983; those with 10 or more years of experience had a median income of $55,000, and many earned more than $100,000. Casualty insurance sales workers usually earned higher incomes.

Insurance sales workers generally pay their own automobile and travel expenses. Independent sales workers must also pay office rent, clerical salaries, and other operating expenses out of their earnings.

Most sales workers have paid vacations, group life and health insurance plans, and retirement pensions. The size of most pensions depends on sales volume.

Related Occupations

Other workers who sell complex or expensive products or services include real estate agents and brokers, securities and financial services sales workers, financial advisors, estate planning specialists, and manufacturers' sales workers.

Sources of Additional Information

General occupational information about insurance sales workers is available from the home office of many life and casualty insurance companies. Information on State licensing requirements may be obtained from the department of insurance at any State capital.

Information about a career as a life insurance sales worker also is available from:

American Council of Life Insurance, 1850 K St. NW., Washington, D.C. 20006.

The National Association of Life Underwriters, 1922 F St. NW., Washington, D.C. 20006.

For career information on casualty insurance sales workers, contact:

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

Independent Insurance Agents of America, 100 Church St., New York, N.Y. 10007.

Alliance of American Insurers, 1501 Woodfield Rd., Suite 400 W., Schaumburg, Ill. 60195.

The National Association of Independent Insurers, Public Relations Department, 2600 River Rd., Des Plaines, Ill. 60018.

Professional Insurance Agents, 400 N. Washington St., Alexandria, Va. 22314.

Manufacturers' Sales Workers

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

Most manufacturers employ sales workers to market their products. Manufacturers' sales workers sell mainly to other businesses—factories, banks, wholesalers, and retailers. They also sell to institutions—hospitals, schools, libraries, and others.

Manufacturers' sales workers visit prospective buyers to inform them about the products they sell, analyze the buyers' needs, suggest how their products can meet these needs, and take orders. Sales workers visit firms in their territory, using an approach adapted to their line of merchandise. Those who handle bakery items, for example, may emphasize wholesomeness, packaging, and variety. Sometimes sales workers promote their firm's products at trade shows and conferences.

Sales workers who deal in technical products, such as electronic equipment, often are called industrial sales workers. Some engineers, often called sales engineers, also sell technical products. In addition to providing information on their firm's products, they help prospective buyers with technical problems. For example, they may recommend improved materials and machinery for a firm's manufacturing process, draw up plans of proposed machinery layout, and estimate cost savings from buying their equipment. They present this information to company officials and negotiate a sale, a process which may take many months. They may work with engineers in their own companies, adapting products to a customer's special needs. Technical sales workers sometimes train customers' employees to operate and maintain new equipment, and make frequent visits to make certain that it is functioning properly.

Manufacturers' sales workers spend most of their time visiting prospective customers. They also prepare reports on sales prospects or customers' credit ratings, plan their work schedules, draw up lists of prospects, make appointments, handle correspondence, and study literature about their products.

Working Conditions

Some manufacturers' sales workers have large territories and do considerable traveling. Because a sales region may cover four or five States, they may be away from home for several days or weeks at a time. Others usually work near their "home base." Manufacturers' sales workers call at the time most convenient to customers and may have to travel at night or on weekends. Frequently, they spend evenings writing reports. However, some are able to plan their schedules for time off when they want it.

Electronic ordering systems often link manufacturers directly to wholesale distributors.

Employment

Manufacturers' sales workers held over 547,000 jobs in 1984. Some worked out of their company's home office, often located at a manufacturing plant. The majority, however, worked out of branch offices, usually in big cities near prospective customers.

Large numbers of sales workers are employed in printing and publishing, chemical, fabricated metal products, and electrical and other machinery industries. In addition, there are many self-employed sales representatives who work for a straight commission based on the dollar amount of their sales. These workers are called independent sales representatives and they may represent more than one manufacturer.

Training, Other Qualifications, and Advancement

Although a college degree is increasingly desirable for a job as a manufacturers' sales worker, many employers hire individuals without a degree who have previous sales experience. Most entrants to this occupation, even those with college degrees, transfer from other occupations, but some are recent graduates. Entrants are older, on average, than entrants to other occupations. Manufacturers of nontechnical products usually seek persons with degrees in liberal arts or business administration. Manufacturers of technical products usually seek those with degrees in science or engineering. Drug sales workers, also known as pharmaceutical detailers, usually need a background in biology and chemistry. Manufacturers of electrical equipment, heavy machinery, and some types of chemicals prefer to hire people who have studied engineering, physics, or chemistry. (Information on chemists, engineers, and others with the technical training suitable for work as manufacturers' sales workers is given elsewhere in the *Handbook*.)

Many companies, especially those that manufacture technical products, have formal training programs for beginning sales workers that last 2 years or longer. In some programs, trainees rotate among jobs in plants and offices to learn all phases of production, installation, and distribution of the product. In others, trainees take formal classroom instruction at the plant, followed by on-the-job training in a branch office under the supervision of a field sales manager.

A pleasant personality and appearance and the ability to get along well with people are important. Because sales workers may have to walk, stand for long periods, or carry product samples, some physical stamina is necessary. As in most selling jobs, arithmetic skills are an asset.

Sales representatives who have good sales records and leadership ability may advance to sales supervisors, branch managers, or district managers. Those with managerial ability eventually may advance to sales manager or other executive positions; many top executives in industry started as sales workers.

Frequent contact with business people in other firms helps sales workers transfer to other jobs. Some go into business for themselves as independent representatives. Others find opportunities in advertising and marketing research.

Job Outlook

Employment in this field is expected to grow more slowly than the average for all occupations through the mid-1990's. Industrial firms, chain stores, and institutions that purchase large quantities of goods at one time frequently buy directly from the manufacturer. The need for sales workers should continue as manufacturers emphasize sales activities to compete for the growing number of these valuable accounts. However, offsetting the demand somewhat will be the increased use by manufacturers of wholesalers and independent sales representatives to sell their products, particularly during economic downturns.

Despite slower than average employment growth, many openings will occur each year because of the need to replace workers who transfer to other occupations, retire, or die. As is the case for other sales jobs, this is a large occupation and turnover is fairly high. Each year, a number of new manufacturers' sales workers discover that they are not cut out for selling and leave the occupation. Because sales are affected by changing economic conditions and consumer preferences, employment opportunities and earnings may fluctuate from year to year.

Earnings

Manufacturers' sales workers may be paid under different types of compensation plans. Some manufacturers pay experienced sales workers a straight commission, based on the dollar amount of their sales (as in the case of independent representatives); others pay a fixed salary. Most use a combination of salary and commission; salary and bonus; or salary, commission, and bonus. Bonus payments may depend on individual performance, on the performance of all sales workers in the group or district, or on the company's performance.

Median annual earnings of full-time manufacturers' sales workers were about $23,400 in 1984. The middle 50 percent earned between $16,600 and $33,800 a year. The bottom 10 percent earned less than $12,500; the top 10 percent earned more than $44,200 a year.

Related Occupations

Manufacturers' sales workers must have sales ability and a specific knowledge of the products they sell. Some related occupations that require these skills are wholesale and retail buyers, field-contact technicians, wholesale trade sales workers, real estate sales workers, insurance sales workers, and securities sales workers.

Sources of Additional Information

For details about job opportunities for manufacturers' sales workers, contact manufacturers in your area.

Real Estate Agents and Brokers

(D.O.T. 250.157, .357 except -022)

Nature of the Work

A house or an apartment, whether purchased as a residence or an investment property to be rented out, is the single most expensive item in most people's budgets. Thus, people generally seek the help of a real estate agent or broker when buying or selling a home. These workers have a thorough knowledge of the housing market in their community. They know which neighborhoods will best fit their clients' budgets, local zoning and tax laws, and where to obtain financing for the purchase. Agents and brokers also act as a medium for price negotiations between buyer and seller.

Brokers are independent business people who not only sell real estate owned by others, but also rent and manage properties, make appraisals, and develop new building projects. In closing sales, brokers often arrange for loans to finance the purchases, for title searches, and for meetings between buyers and sellers when details of the transactions are agreed upon and the new owners take possession. A broker's knowledge, resourcefulness, and creativity in arranging financing that is most favorable to the prospective buyer often mean the difference between success and failure in closing a sale. In some cases, agents assume the responsibilities in closing sales. Brokers also manage their own offices, advertise properties, and handle other business matters. Some combine other types of work, such as the sale of insurance or the practice of law, with their real estate business.

Real estate agents generally are independent sales workers who provide their services to a licensed broker on a contract basis. Today, relatively few agents work as employees of a broker or realty firm.

In selling or renting real estate, brokers and agents generally first meet with potential buyers to get a feeling for the type of home they would like and can afford. Then, they may take the client to see a number of homes that appear to meet the needs and income of the client. Because real estate is so expensive, agents may have to meet several times with a prospective buyer to discuss properties. In answering questions, agents emphasize those selling points that are likely to be most important to the buyer. To a young family looking at a house, for example, they may point out the convenient floor plan and the fact that schools and shopping centers are close by. To a potential investor seeking the tax advantages of owning a rental property, they may point out the proximity to the city and the ease of finding a renter. Whenever bargaining over price becomes necessary, agents carefully follow the seller's instructions and may present counteroffers in order to get the best possible price.

There is more to agents' and brokers' jobs, however, than just selling. Since they must have properties to sell, they spend a significant amount of time obtaining "listings" (owner agreements to place properties for sale with the firm). Much time is spent on the telephone exploring leads gathered from advertisements and personal contacts. When listing property for sale, agents and brokers make comparisons with similar property being sold to determine its fair market value.

Most real estate agents and brokers sell residential property. A few, usually in large firms, specialize in commercial, industrial, agricultural, or other types of real estate. Each specialty requires knowledge of that particular type of property and clientele. Selling or leasing business property, for example, requires an understanding of leasing practices, business trends, and location needs. Agents who sell or lease industrial properties must know about transportation, utilities, and labor supply. To sell residential properties, the agent must know the location of schools, religious institutions, shopping facilities, and public transportation, and be familiar with tax rates and insurance coverage.

Working Conditions

Although real estate agents and brokers generally base their operations in offices, most of their time is spent outside the office—showing properties to clients, evaluating properties for sale, meeting with prospective clients, and performing a wide range of other duties. Brokers provide office space, but agents generally furnish their own automobiles.

Agents and brokers often work more than a standard 40-hour week. In addition, they often work evenings and weekends to suit the convenience of their clients.

Employment

Real estate agents and brokers held about 363,000 jobs in 1984. Many worked part time.

Most real estate firms are relatively small; indeed, some brokers operate a one-person business. Some large firms have several hundred real estate agents operating out of many branch offices. About one-sixth of all brokers have franchise agreements with national or regional real estate organizations. Under this type of arrangement, similar to many fast-food restaurant operations, the broker pays a fee in exchange for the privilege of using the more widely known name of the parent organization. Although franchised

OAKHURST
FURNISHED
MODELS

Real estate agents show prospective customers homes that fit their needs and income.

brokers often receive help in training salespeople and in running their offices, they bear the ultimate responsibility for the success or failure of the firm.

Real estate is sold in all areas, but employment is concentrated in large urban areas and in smaller but rapidly growing communities.

Training, Other Qualifications, and Advancement

Real estate agents and brokers must be licensed in every State and in the District of Columbia. All States require prospective agents to be a high school graduate, be at least 18 years old, and pass a written test. The examination—more comprehensive for brokers than for agents—includes questions on basic real estate transactions and on laws affecting the sale of property. Most States require candidates for the general sales license to complete at least 30 hours of classroom instruction and those seeking the broker's license to complete 90 hours of formal training in addition to a specified amount of experience in selling real estate (generally 1 to 3 years). Some States waive the experience requirements for the broker's license for applicants who have a bachelor's degree in real estate. A small, but increasing number of States require that agents have 60 hours of college credit—roughly the equivalent of an associate degree. State licenses generally must be renewed every year or two, usually without reexamination. Some States, however, require continuing education for license renewal.

Persons who take real estate sales positions are older, on average, than entrants to most other occupations. Many homemakers and retired persons are attracted by the flexible and part-time work schedules characteristic of this field and may enter, leave, and later reenter the occupation, depending on the strength of the housing market, family responsibilities, and other personal factors. In addition to labor force entrants and reentrants, others transfer into real estate sales jobs from a wide range of occupations, including clerical and other sales jobs.

As real estate transactions have become more complex, many of the large firms have turned to college graduates to fill sales positions. A large number of agents have some college training, and the number of college graduates selling real estate has risen substantially in recent years. However, personality traits are fully as important as academic background. Brokers look for applicants who possess such characteristics as a pleasant personality, honesty, and a neat appearance. Maturity, tact, and enthusiasm for the job are required in order to motivate prospective customers in this keenly competitive field. Agents also should have a good memory for names and faces and business details, such as taxes, zoning regulations, and local land-use laws.

Persons interested in beginning jobs as real estate agents often apply in their own communities, where their knowledge of local neighborhoods is an advantage. The beginner usually learns the practical aspects of the job, including the use of computers to locate or list available properties or identify available sources of financing, under the direction of an experienced agent.

Many firms offer formal training programs for both beginners and experienced agents. Larger firms generally offer more extensive programs than smaller firms. Over 1,000 universities, colleges, and junior colleges offer courses in real estate. At some, a student can earn an associate or bachelor's degree with a major in real estate; several offer advanced degrees. Many local real estate boards that are members of the National Association of Realtors sponsor courses covering the fundamentals and legal aspects of the field. Advanced courses in appraisal, mortgage financing, property development and management, and other subjects also are available through various National Association affiliates.

Trained and experienced agents can advance in many large firms to sales or general manager. Persons who have received their broker's license may open their own offices. Training and experience in estimating property value can lead to work as a real estate appraiser, and people familiar with operating and maintaining rental properties may specialize in property management. Those who gain general experience in real estate and a thorough knowledge of business conditions and property values in their localities may enter mortgage financing or real estate investment counseling.

Job Outlook

Employment of real estate agents and brokers is expected to grow about as fast as the average for all occupations through the mid-1990's as a result of growing demand for sales and rental housing and other properties. However, most job openings will occur each year as workers transfer to other occupations, retire, or stop working for other reasons. Many beginners become discouraged by their inability to close a sufficient number of sales and subsequently leave the occupation.

Employment growth in this field will stem primarily from increased demand for home purchases and rental units. Shifts in the age distribution of the population over the next decade will result in a larger number of prime working age persons (25-54 years old) with careers and family responsibilities. This is the most geographically mobile group in our society and the one that traditionally makes most of the home purchases. As their incomes rise, these people also may be expected to invest in additional real estate. However, employment of agents and brokers is not expected to keep pace with real estate sales because the use of computers to locate and list properties or identify available sources of financing allows each agent and broker to handle more business. During periods of declining economic activity and tight credit, the volume of sales and the resulting demand for sales workers may decline. During these periods, the number of persons seeking sales positions may outnumber openings.

Real estate sales positions should continue to be relatively easy to obtain. Not everyone is successful in this highly competitive field, however; well-trained, ambitious people who enjoy selling should have the best chance for success.

Earnings

Commissions on sales are the main source of earnings—very few real estate agents work for a salary. The rate of commission varies according to the type of property and its value; the percentage paid on the sale of farm and commercial properties or unimproved land usually is higher than that paid for selling a home.

Commissions may be divided among several agents and brokers. The broker and agent in the firm that obtained the listing generally share their part of the commission when the property is sold; the broker and agent in the firm that made the sale also generally share their part of the commission. Although an agent's share varies greatly from one firm to another, often it is about half of the total amount received by the firm.

The median income of full-time real estate agents was estimated to be about $19,000 a year in 1984. Real estate brokers earned an estimated median gross personal income (after expenses) of $31,600 a year. The most successful agents and brokers earn considerably more. Some firms, especially the large ones, furnish group life, health, and accident insurance.

Income usually increases as an agent gains experience, but individual ability, economic conditions, and the type and location of the property also affect earnings. Sales workers who are active in community organizations and local real estate boards can broaden their contacts and increase their earnings. A beginner's earnings often are irregular because a few weeks or even months may go by without a sale. Although some brokers allow an agent a drawing account against future earnings, this practice is not usual with new employees. The beginner, therefore, should have enough money to live on until commissions increase.

Related Occupations

Selling expensive items such as homes requires maturity, tact, and a sense of responsibility. Other sales workers who find these character traits important in their work include automobile sales workers, securities sales workers, insurance agents and brokers, yacht brokers, travel agents, and manufacturers' representatives.

Sources of Additional Information

Details on licensing requirements for real estate agents and brokers are available from most local real estate organizations or from the State real estate commission or board.

For more information about opportunities in real estate work, as well as a list of colleges and universities offering courses in this field, contact:

National Association of Realtors, 430 North Michigan Ave., Chicago, Ill. 60611.

Retail Sales Workers

(D.O.T. 261.354; .357-046, -058, -062 through -074; 270.357-038; 277.357-046; 279.357-054; 290.477; 299.377, .467, and .677-010)

Nature of the Work

The success of any retail establishment depends largely on its sales workers. Courteous and efficient service from behind the counter or on the sales floor does much to satisfy customers and build a store's reputation.

Whether selling furniture, electrical appliances, or clothing, a sales worker's primary job is to interest customers in the merchandise. This is done by describing the product's construction, demonstrating its use, and showing various models and colors. For some jobs, particularly those selling expensive, "big ticket" items, special knowledge or skills are needed. Personal computer sales workers, for example, must have sufficient knowledge of electronics to explain to customers the features of various brands and models and the meaning of manufacturers' specifications.

In addition to selling, most retail sales workers make out sales checks, receive cash payments, and give change and receipts. More and more stores are installing point-of-sale terminals that register sales, adjust inventory figures, and perform simple calculations. This equipment increases workers' productivity—enabling them to provide better customer service. They also handle returns and exchanges of merchandise and keep their work areas neat. In addition, they may help stock shelves or racks, mark price tags, take inventory, and prepare displays. However, in jobs selling standardized articles such as food, hardware, linens, and housewares, sales workers often do little more than take payments and wrap purchases. (Cashiers, who have similar job duties, are discussed elsewhere in the *Handbook*.)

Working Conditions

Most sales workers in retail trade work in clean, comfortable, well-lighted stores. Some, however, work outside the store. Kitchen equipment sales workers may visit prospective customers' homes, for example, to help them plan renovations, and used-car sales workers may spend much time at an outdoor lot. Many sales workers must stand for long periods.

Although many sales workers have a 5-day, 40-hour week, the standard workweek is longer in some stores. Because Saturday is a busy day in retailing, employees usually work that day and have a weekday off. Longer than normal hours may be scheduled before Christmas and during other peak periods. Some, especially those employed by stores in suburban shopping centers, regularly work one evening or more a week.

Part-time sales workers generally work during peak hours of business—daytime rush hours, evenings, and weekends.

Many sales workers are employed on a part-time basis.

Employment

Retail sales workers held about 4 million jobs in 1984. They worked in stores ranging from the small drug or grocery store employing one part-time sales person to the giant department store with hundreds of sales workers. In addition, some were self-employed representatives of direct sales companies and mail-order houses.

The largest employers of retail sales workers are department and other general merchandise stores, apparel and accessories stores, food, drug, and furniture stores, and car dealers.

Most of the sales workers who sell "big ticket" items work full time; three-fifths of other sales workers work part time.

Retail sales jobs are distributed geographically much the same way as the population; most sales workers are employed in cities and their nearby suburbs.

Training, Other Qualifications, and Advancement

For many persons, a job as a retail sales worker serves as a source of immediate income rather than a career. Most entrants are under 25 years of age. Many have little or no work experience and are students or homemakers looking for part-time work.

Thousands of high schools across the country have distributive education programs, generally a cooperative arrangement between the school and businesses. Students work part time at local stores while taking courses in merchandising, accounting, and other aspects of retailing. The experience and education gained can improve their prospects for permanent employment.

Persons interested in sales jobs should apply to the personnel offices of large retail stores, where they are likely to be interviewed and, in some cases, given an aptitude test. Employers prefer persons who enjoy working with people and have the tact to deal with difficult customers. Among other desirable characteristics are an interest in sales work, a pleasant personality, a neat appearance, and the ability to communicate clearly.

In most small stores, an experienced employee or the proprietor instructs newly hired sales personnel in making out sales checks and operating the cash register. In many larger stores, training programs are more formal and include specialized training in selling certain products.

Inexperienced sales workers in department stores typically begin in housewares, notions, and other departments where a customer needs little assistance. As they gain experience and seniority, they move to positions of greater responsibility. The most experienced—and the highest paid—sales workers sell "big ticket" items such as large appliances, furniture, and rugs. This work requires the most knowledge of the product and the greatest talent for persuasion.

Traditionally, capable sales workers without a college degree could advance to management positions. However, a college education is becoming increasingly important for these jobs. Large retail businesses generally prefer to hire college graduates as management trainees. Despite this trend, capable employees without a college degree should still be able to advance to administrative or supervisory work in large stores.

Opportunities for advancement are limited in small stores, where one person, often the owner, does most of the managerial work. Retail selling experience may be an asset in qualifying for sales work with wholesalers or manufacturers.

Job Outlook

Employment of retail sales workers is expected to grow about as fast as the average for all workers through the mid-1990's. While the volume of goods sold is expected to grow rapidly, the continuation of self-service and the increase in computerized checkout systems will reduce somewhat the need for additional sales workers. However, employment in stores selling "big ticket" items will be much less affected since these items are not likely to be sold self-service.

Retail trade sales work will continue to provide more job openings than almost any other occupation through the mid-1990's. Prospects for sales jobs are good because retail selling is a large occupation and turnover is high. There will continue to be many opportunities for part-time workers, as well as for temporary workers during peak selling periods such as the Christmas season.

During recessions, sales volume and the resulting demand for sales workers may decline. Purchases of durable goods and "big ticket" items, such as cars and appliances, are likely to be postponed during difficult economic times. In areas of high unemployment, sales of all types of goods may decline. Layoffs, however, are unlikely. Since sales worker turnover is usually very high, employers often can cut employment simply by not replacing all those who leave.

Earnings

In 1984, the starting wage for most retail sales positions (including part time and temporary) not covered by union contracts was the Federal minimum wage, $3.35 an hour. Some stores doing less than $362,500 in business per year paid less, since they are not required to pay the minimum wage. Median weekly earnings of full-time retail sales workers were about $290 in 1984. The middle 50 percent earned between $170 and $360 a week; 10 percent earned less than $130 a week; and 10 percent earned more than $510. Earnings vary widely by type of goods sold, as the following table shows.

Table 1. Average weekly earnings of retail sales workers by industry, 1984

Industry	Weekly earnings
All retail sales workers	$288
Motor vehicles and boats	427
Radio, television, hi-fi, appliances	341
Door-to-door sales	324
Furniture and home furnishings	314
Hardware and building supplies	305
Newspapers and magazines	303
Automotive parts	294
Shoes	236
Apparel	212
Other commodities	244

SOURCE: Bureau of Labor Statistics.

Some sales workers receive salary plus commissions—that is, a percentage of the sales they make. Others are paid only on a commission or salary basis. Those paid by commission may find their earnings greatly affected by ups and downs in the economy.

Sales workers in many retail stores may buy merchandise at a discount, often from 10 to 25 percent below regular prices. This privilege sometimes is extended to the employee's family. Some stores, especially the large ones, pay part or all of the cost of life insurance, health insurance, and a pension.

Related Occupations

Sales workers apply a general knowledge of sales techniques and specific knowledge of the products they sell. These skills are used by people in a number of other occupations, including demonstrators, route drivers, real estate sales agents, telephone solicitors, wholesale and retail buyers, insurance agents and brokers, manufacturers' representatives, and cashiers.

Sources of Additional Information

Information on careers in retail sales may be obtained from the personnel offices of local stores; from State merchants' associations; or from local unions of the United Food and Commercial Workers International Union.

Information on distributive education programs may be obtained from your State employment service.

A list of schools that offer programs in retailing is available from:

U.S. Department of Education, Division of Vocational/Technical Education, Washington, D.C. 20202.

Securities and Financial Services Sales Workers

(D.O.T. 162.157-014, -042; 251.157, .257-010)

Nature of the Work

Securities sales workers. Most investors—whether they are individuals with a few hundred dollars or large institutions with millions to invest—call on securities sales workers when buying or selling stocks, bonds, shares in mutual funds, or other financial products. Securities sales workers often are called *registered representatives, account executives*, or *brokers*.

When an investor wishes to buy or sell securities, sales workers may relay the order through their firms' offices to the floor of a securities exchange, such as the New York Stock Exchange. There, securities sales workers known as *brokers' floor representatives* buy and sell securities. If a security is not traded on an exchange, the sales worker sends the order to the firm's trading department, which trades it directly with a dealer in the over-the-counter market. After the transaction has been completed, the sales worker notifies the customer of the final price.

Securities sales workers also provide many related services for their customers. Depending on a customer's knowledge of the market, they may explain the meaning of stock market terms and trading practices; offer financial counseling; devise an individual financial portfolio for the client including securities, life insurance, tax shelters, mutual funds, annuities, and other investments; and offer advice on the purchase or sale of a particular security.

Not all customers have the same investment goals. Some individuals may prefer long-term investments designed either for capital growth or to provide income over the years; others might want to invest in short-term securities that they hope will rise in price quickly. Securities sales workers furnish information about the advantages and disadvantages of an investment based on each person's objectives. They also supply the latest price quotations on any security in which the investor is interested, as well as information on the activities and financial positions of the corporations issuing these securities.

Securities sales workers may serve all types of customers or they may specialize in one type only, such as institutional investors. In institutional investing, most sales workers specialize in a specific financial product such as stocks, bonds, options, annuities, or commodity futures. Some handle the sale of new issues, such as corporation securities issued to finance plant expansion.

Beginning securities sales workers spend much of their time searching for customers—relying heavily on telephone solicitation. They may meet some clients through business and social contacts. Many sales workers find it useful to get additional exposure by teaching adult education investment courses or giving lectures at libraries or social clubs.

Financial services sales workers. Financial services sales workers call on various businesses to solicit applications for loans and new deposit accounts for banks or savings and loan associations. They also locate and contact prospective customers to present their bank's financing services and to ascertain the customer's banking needs. At most smaller and medium-size banks, branch managers and commercial loan officers are responsible for marketing the bank's financial services.

Working Conditions

Securities sales workers usually work in offices where there is much activity. They have access to "quote boards" or computer terminals that continually provide information on the prices of securities. When sales activity increases, due perhaps to un-

Securities sales workers spend most of their time talking to clients.

anticipated changes in the economy, the pace may become very hectic.

Established securities sales workers usually work the same hours as others in the business community. Beginners who are seeking customers may work much longer hours, however. Most securities sales workers accommodate customers by meeting with them in the evenings or on weekends.

Financial services sales workers generally work in a comfortable, less stressful office environment. They generally work 40 hours a week. They may spend considerable time outside the office meeting with present and prospective clients, attending civic functions, and participating in trade association meetings.

Employment

Securities and financial services sales workers held about 81,000 jobs in 1984. In addition, a substantial number of people in other occupations sold securities. These include partners and branch office managers in securities firms as well as insurance agents and brokers offering securities to their customers.

Securities sales workers are employed by brokerage and investment firms in all parts of the country. Many of these firms are very small. Most sales workers, however, work for a small number of large firms with main offices in big cities (especially in New York) and approximately 14,000 branch offices in other areas.

Financial services sales workers are employed by banks, savings and loan associations, and other credit institutions.

Training, Other Qualifications, and Advancement

Because securities sales workers must be well informed about economic conditions and trends, a college education is increasingly important, especially in the larger securities firms. In fact, the overwhelming majority of entrants to this occupation are college graduates. Although employers seldom require specialized academic training, courses in business administration, economics, and finance are helpful.

Many employers consider personal qualities and skills more important than academic training. Employers seek applicants who have good communication skills, are well groomed, and have a strong desire to succeed. Self-confidence and an ability to handle frequent rejections also are important ingredients for success.

Because maturity and the ability to work independently also are important, many employers prefer to hire those who have achieved success in other jobs. Some firms prefer candidates with sales experience, particularly those who have worked on commission in areas such as real estate or insurance. Understandably, most entrants to this occupation transfer from other jobs. Some begin working as securities sales workers following retirement from other fields.

Securities sales workers must meet State licensing requirements, which generally include passing an examination and, in some cases, furnishing a personal bond. In addition, sales workers must register as representatives of their firm according to regulations of the securities exchanges where they do business or the National Association of Securities Dealers, Inc. (NASD). Before beginners can qualify as registered representatives, they must pass the Securities and Exchange Commission's General Securities Examination, or examinations prepared by the securities exchanges or the NASD. Large national brokerage firms may require a second examination—the Uniform Securities Agents State Law Examination—that allows sales workers to do business nationwide. These tests measure the prospective representative's knowledge of the securities business, customer protection, and recordkeeping procedures.

Most employers provide on-the-job training to help securities sales workers meet the requirements for registration. In most firms, the training period takes at least several months. Trainees in large firms may receive classroom instruction in securities analysis, effective speaking, and the finer points of selling; take courses offered by business schools and other institutions and associations; and undergo a period of on-the-job training lasting up to 2 years. In small firms, sales workers generally receive training in outside institutions and on the job. Many trainees take correspondence courses in preparation for the securities examinations.

Securities sales workers periodically take training, through their firms or outside institutions, to keep abreast of new financial products as they are introduced on the market. Training in the use of computers is important, as the securities sales business is highly automated.

The principal form of advancement for securities sales workers is an increase in the number and size of the accounts they handle. Although beginners usually service the accounts of individual investors, eventually they may handle very large institutional accounts such as those of banks and pension funds. Some experienced sales workers become branch office managers and supervise other sales workers while continuing to provide services for their own customers. A few representatives advance to top management positions or become partners in their firms.

Banks and other credit institutions prefer to hire college graduates for financial services sales jobs. A business administration degree with a specialization in finance or a liberal arts degree including courses in accounting, economics, and marketing serves as excellent preparation for this job.

Financial services sales workers learn through on-the-job training under the supervision of bank officers. Outstanding performance can lead to promotion to managerial positions.

Job Outlook

The number of securities sales workers is expected to grow much faster than the average for all occupations through the mid-1990's. Most job openings, however, are expected to be created by workers who transfer to other jobs, retire, or stop working for other reasons. Due to the highly competitive nature of securities sales work, many beginners leave the field because they are unable to establish a sufficient clientele. Once established, however, securities sales workers have a relatively strong attachment to their occupation because of high earnings and the considerable investment in training.

Faster than average employment growth is expected among financial services sales workers as a result of the continued expansion in banking services and the need to finance an increasing level of commercial activity.

Employment of securities sales workers is expected to expand as economic growth, rising personal incomes, and greater inherited wealth increase the funds available for investment. Growth in the number and size of institutional investors will be particularly strong as more people enroll in pension plans, set up individual retirement accounts, establish trust funds, and contribute to the endowment funds of colleges and other nonprofit institutions. In addition, more workers will be needed to sell securities issued by new and expanding corporations and by State and local governments financing public improvements. Job opportunities should be best for mature individuals with successful work experience.

The demand for securities sales workers fluctuates as the economy expands and contracts. Thus, in an economic downturn the number of persons seeking jobs usually exceeds the number of openings—sometimes by a great deal. Even during periods of rapid economic expansion, however, competition for securities sales training positions is keen because of potentially high earnings.

Earnings

According to the Securities Industry Association, earnings of full-time, experienced securities sales workers who served individual investors averaged about $64,000 a year in 1984. The relatively small number of sales workers who handled institutional accounts averaged about $156,000.

Trainees usually are paid a salary until they meet licensing and registration requirements. After registration, a few firms continue to pay a salary until the new representative's commissions increase to a stated amount. The salaries paid during training usually range from $900 to $1,200 a month.

After candidates are licensed and registered, their earnings depend on commissions from the sale or purchase of stocks and bonds, life insurance, or other securities for customers. Commission earnings are likely to be high when there is much buying and selling and lower when there is a slump in market activity. Most firms provide sales workers with a steady income by paying a "draw against commission"—that is, a minimum salary based on the commissions which they can be expected to earn. Securities sales workers who can provide their clients with the most complete financial services should enjoy the greatest income stability.

Financial services sales workers are paid a salary; some receive bonuses if they meet certain established goals. Average earnings of financial services sales workers are considerably less than those of securities sales workers.

Related Occupations

Similar sales jobs requiring specialized knowledge include insurance agents and real estate agents.

Sources of Additional Information

Further information concerning a career as a securities sales worker is available for $1 from:

Securities Industry Association, 120 Broadway, New York, N.Y. 10271.

Career information also may be obtained from the personnel departments of individual securities firms.

For information about job opportunities for financial services sales workers in various States, contact State bankers' associations. Or write directly to a particular bank to inquire about job openings. For the names and addresses of banks in a specific location as well as the names of their principal officers, consult one of the following directories, which are published twice each year:

The American Bank Directory (Norcross, Ga., McFadden Business Publications).

Polk's World Bank Directory (Nashville, R.L. Polk & Co.).

Travel Agents

(D.O.T. 252.157)

Nature of the Work

Planning your vacation or a business trip can be frustrating and time consuming. Many travelers, therefore, seek the assistance of travel agents—specialists who have the information and know-how to make the best possible travel arrangements, with their clients' tastes, budgets, and other requirements in mind.

Consider, for example, the contrast between arrangements for an executive with a tight schedule and for a family of four on a restricted budget, both planning a visit to Washington, D.C. For the executive, an agent might arrange a first class flight, a hotel suite that could be used for business meetings, and a limousine ready upon arrival for business calls. For the family, on the other hand, the travel agent would recommend less expensive, off-season, all-inclusive packages and special air fares. The agent would describe a wide range of hotel facilities and arrange the most economical but pleasurable trip. The agent also might arrange for car rental or escorted bus tours, suggest local tourist attractions and restaurants, and acquaint the family with the city's climate.

For international travel, the agent might also provide information on customs regulations, required papers (passports, visas, and certificates of vaccination), and the most recent currency exchange rates.

When making travel arrangements, travel agents consult a variety of sources for information on departure and arrival times, fares, and hotel ratings and accommodations. Most travel agents rely on computers for up-to-the minute information on fares and schedules. They often use their own or co-workers travel experiences as a basis for making recommendations. Travel agents may devote some of their time to visiting hotels, resorts, and restaurants to rate their comfort, cleanliness, and quality of food and service.

Travel agents also do considerable promotional work. They may give slide or movie presentations to social and special interest groups, arrange advertising displays, and meet with business managers to suggest company-sponsored trips.

Working Conditions

Travel agents spend most of their time behind a desk conferring with clients, completing paperwork, contacting airlines and hotels for travel arrangements, and promoting group tours. They may be under a great deal of pressure during busy vacation seasons. Many agents, especially those who are self-employed, frequently work long hours. When they do travel, travel agents usually get substantially reduced rates. Sometimes hotels or resorts offer travel agents free promotional holidays.

Employment

Travel agents held 72,000 jobs in 1984. Though travel agents work in every part of the country, they are concentrated in major population centers where the best business opportunities exist. About one-half of all travel agencies are in large cities; one-third, in suburban areas; and one-fifth, in small towns and rural areas.

Some travel agents are self-employed. Generally, these persons gained experience and recognition in an established travel agency before going into business for themselves.

Training, Other Qualifications, and Advancement

Travel courses are offered in private vocational schools, adult education programs in public high schools, community colleges, and 4-year colleges. A few colleges offer a bachelor's and a master's degree in travel and tourism. Although few college courses relate directly to the travel industry, a college education is sometimes desired by employers. Courses in computer science, geography, foreign languages, and history are most useful. Courses in accounting and business management also are important, especially for those who expect to manage or start their own travel agencies. Several home-study courses provide a basic understanding of the travel industry. Employers prefer applicants with computer skills. Since these are becoming increasingly important, a significant part of training courses and on-the-job training consists of computer instructions.

Persons can prepare for careers as travel agents by working part time as reservation clerks or receptionists in travel agencies. As they gain experience, they may enter either a formal or informal training program given by the agency, take on greater responsibilities, and eventually assume the full workload of a travel agent. In large travel agencies with offices in many cities, travel agents may advance to office manager or to other managerial positions. Experience as an airline reservation agent also is a good background for a travel agent. Broad experience as a national or international traveler is an asset, since the ability to speak with some personal knowledge about a city or foreign country often helps to influence clients' travel plans.

Personal experience in visiting other countries can help travel agents advise clients.

As a sales representative, the travel agent must be pleasant and patient. Agents often must demonstrate their efficiency and sense of responsibility to hard-to-please clients.

Experienced travel agents can take an advanced course, leading to the designation of Certified Travel Counselor, offered by the Institute of Certified Travel Agents. Another recognized mark of achievement in this field is a certificate of proficiency from the American Society of Travel Agents. It is awarded to those who pass a test covering the duties of travel agents.

Travel agents who start their own agencies must gain formal conference approval before they can receive commissions. Conferences are organizations of airlines, shiplines, or rail lines. The Airlines Reporting Corporation, for example, is the conference of airlines. To gain conference approval, an agency must be in operation, be financially sound, and employ at least one experienced travel agent.

Since conference approval can take time to obtain, most self-employed agents make very little profit in their first year. Their income generally is limited to commissions from hotels, cruises, and tour operators and to nominal fees for making complicated arrangements. For those starting their own agency, working capital of more than $35,000 will be needed to carry the agency through a profitless first year.

There are no Federal licensing requirements for travel agents. However, Ohio, Rhode Island, and Hawaii now have licensing requirements. In California, travel agents not approved by a conference are required to have a license.

Job Outlook

Employment of travel agents is expected to grow much faster than the average for all occupations through the mid-1990's. Many job openings will arise as new agencies open and existing agencies expand, but most will occur as experienced agents transfer to other occupations or leave the labor force. However, since the industry generally is sensitive to the fluctuations of the economy, opportunities at any given time depend heavily upon whether or not people or businesses can afford travel. Long-distance travel plans are likely to be deferred during economic downturns.

Despite economic fluctuations, spending on travel is expected to increase significantly through the mid-1990's. As business activity expands, so will business-related travel. Also, with rising incomes and increasing emphasis on leisure-time activities, more people are expected to travel—and to do so more frequently—than in the past.

The use of charter flights and larger, more efficient planes, especially for trips to other countries, has brought air transportation within the budget of many Americans. The recent easing of Government regulation of air fares and routes should also help increase traveling by fostering greater competition among airlines to offer better and more affordable service. More travel agents will be needed to handle this extra business. In addition, American travel agents often organize tours for the growing number of foreign visitors. Although most travel agencies now have automated reservation systems, this has not weakened demand for travel agents. Deregulation has resulted in more work for travel agents. New airline entrants and volatility of airfares and schedules have made the computer an essential tool.

Earnings

Experience, sales ability, and the size and location of the agency determine the salary of a travel agent. Based on limited information, salaries of travel agents generally ranged from $10,000 to over $20,000 a year in 1984. Salaried agents usually have standard benefits—pension plans, insurance coverage, paid vacations—that self-employed agents must provide for themselves.

Earnings of travel agents who own their agencies depend mainly on commissions from airlines and other carriers, cruise lines, tour operators, and lodging places. Commissions for domestic travel arrangements, cruises, hotels, sightseeing tours, and car rentals are about 10 percent; and for international travel, about 8 percent. When travel agents arrange individual plans that require several connections on different kinds of transportation, they generally charge the customer a service fee for the time and expense involved.

During the first year of business or while awaiting conference approval, self-employed travel agents generally have low earnings. Even established agents experience less profitable years during periods of economic downturn.

Related Occupations

Travel agents organize and schedule business, educational, or recreational travel or activities. Other workers with similar responsibilities include secretaries, tour guides, airline reservation agents, rental car agents, and travel counselors.

Sources of Additional Information

For further information on training opportunities, contact:

American Society of Travel Agents, 4400 MacArthur Blvd. NW., Washington, D.C. 20007.

Wholesale Trade Sales Workers

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

Sales workers in wholesale trade facilitate the movement of goods from the factory to the consumer. They represent wholesalers who distribute products to stores selling directly to the consumer. A wholesale drug sales worker, for example, may sell many brands of drugs, soap, and cosmetics to local pharmacies. Likewise, a wholesale construction materials distributor sells lumber, bricks, glass, and other construction materials to builders who would otherwise have to deal with many manufacturers.

Wholesale trade sales workers visit buyers for retail, industrial, and commercial firms, and institutions such as schools and hospitals. They show samples, pictures, or catalogs which describe items that their company stocks. They may also show customers how their products can save money and improve productivity. These sales workers seldom urge customers to purchase any particular product, since they handle a large number of items. Instead, they offer prompt, dependable service so buyers will become regular customers.

Wholesale trade sales workers perform many services for retailers, such as checking the store's stock and ordering items that will be needed before the next visit. Some wholesale sales workers help retailers improve and update ordering and inventory systems and advise them about advertising, pricing, and window and counter displays. Sales workers who handle machinery may give technical assistance on installation and maintenance.

Sales workers keep records of sales, forward orders to their wholesale firms, prepare reports and expense accounts, plan work schedules, draw up lists of prospects, make appointments, and study literature describing their products. Some collect payments for their companies.

Working Conditions

Sales workers often have long, irregular working hours. Although they call on customers during business hours, they may travel at night or on weekends in order to meet their schedules. However, most sales workers seldom are away from home for more than a few days at a time. They may spend evenings writing reports and orders, carry heavy catalogs and sample cases, and be on their feet for long periods.

Employment

Wholesale trade sales workers held about 1.2 million jobs in 1984. Firms selling machinery to industrial and business users are the largest employers of wholesale trade sales workers.

Wholesale trade sales workers occasionally monitor inventory levels.

Other large employers are companies that sell food products, motor vehicles and parts, hardware and plumbing, and electrical goods.

Most wholesale trade sales workers operate out of the home office of their firm, which usually is located in a large city. Sales workers may cover a territory in a small section of a city with many retail stores and industrial users; or, in less populated regions, they may cover half a State or more.

Training, Other Qualifications, and Advancement

The background needed for sales jobs varies by product line and market. Complex products require technical backgrounds. Drug wholesalers, for example, seek people with a college degree in chemistry, biology, or pharmacy as trainees. Wholesalers provide training on characteristics of their products and how to sell them. For nontechnical products such as food, sales ability and familiarity with manufacturers and brands are more important than knowledge about the product itself.

Most wholesale trade sales workers get their jobs by working up the ladder, or by transferring into the firm if they have the appropriate background. Some employers hire high school graduates for nonselling jobs or as sales trainees. These beginners usually work in several kinds of nonselling jobs before being assigned to sales. They may start in the stockroom or shipping department to become familiar with the thousands of items the wholesaler carries or in the bookkeeping department to learn about prices and recordkeeping. They are likely to work on "inside" sales, writing telephone orders, before they actually observe and work with experienced sales workers on visits to customers. Usually, it takes 2 years or longer to prepare trainees for outside selling.

In very large wholesale firms, sales trainees participate in formal training programs that combine classroom instruction with short rotations in nonselling jobs. In most firms, however, trainees learn informally by observing experienced workers and trying the different aspects of the work. As they become familiar with customers and procedures, they gradually take on the full responsibility of the job.

Experienced sales workers also transfer from manufacturing and retail trade sales positions. Their experience with a particular product line gives them an advantage over the newcomers to the field because they don't require as much on-the-job training.

Sales workers sometimes can augment their on-the-job training with college courses relevant to wholesale distribution; courses in marketing and business administration are especially useful. Trade associations also sponsor training programs.

Experienced sales workers with leadership and sales ability may advance to supervisor, sales manager, or other executive positions.

Job Outlook

The number of wholesale sales workers is expected to grow faster than the average for all occupations through the mid-1990's as the volume and kinds of goods produced in the economy expand. Most businesses and institutions that require a wide variety of products for their own use and for eventual resale will continue to purchase these products from wholesaler-distributors. Also, manufacturers are expected to rely more extensively on wholesalers and independent sales representatives, who sell manufacturers' products solely on a commission basis. As wholesalers expand their product lines and the number of sales districts, the demand for capable sales workers will rise.

In addition to new positions created by increased demand, many openings each year will result as experienced sales workers transfer to other jobs, retire, or stop working for other reasons. The number of replacements will be quite large because the occupation is large and turnover is very high.

Earnings

Compensation plans differ among firms. One plan is salary plus a commission based on sales; other types are straight commission or straight salary. Some include a bonus. Although most wholesale trade sales workers have steady, year-round work, sales (and commissions) on products like air-conditioners fluctuate through the year. To provide sales workers with a steady income, many companies pay them a "draw" against annual commissions.

Median weekly earnings of full-time wholesale trade sales workers were about $450 in 1984. The middle 50 percent earned between $320 and $650 a week; 10 percent earned less than $240; and 10 percent earned more than $850 a week.

Related Occupations

In addition to sales ability, wholesale trade sales workers often have a knowledge of hundreds of similar products. Some occupations requiring the same skills are buyers, sales-service promoters, manufacturing sales workers, field contact technicians, and demonstrators.

Sources of Additional Information

Information on jobs in wholesale selling may be obtained directly from local wholesale houses or from associations of wholesalers in many of the larger cities.

Administrative Support Occupations, Including Clerical

In 1984, there were about 19 million jobs in administrative support occupations, including clerical. Workers in this group prepare and keep records; operate office machines; arrange schedules and make reservations; collect, distribute, or account for money, material, mail, or messages; or perform similar administrative duties. Administrative support jobs can be found in virtually all industries.

Employment of these workers is expected to grow more slowly than the average for all occupations through the mid-1990's. In large part, this is due to the spread of automated office equipment. From word processors in business offices to optical character readers in post offices to computerized reservation systems in airports, these new machines have raised workers' productivity and have led to faster and more efficient services. While eliminating some jobs and creating others, this technological revolution—based on the computer microchip—has altered the way many clerical workers perform their jobs. Far-reaching changes in the office environment are expected to continue through the mid-1990's.

Employers prefer high school graduates for clerical jobs. They look for people who understand what they read, know basic spelling and grammar, and can use arithmetic. The ability to type and do neat, accurate paperwork is required for nearly all entry level positions; some employers give applicants typing or clerical aptitude tests. For jobs such as bank clerk, bookkeeper, cashier, collection worker, and statistical clerk, an ability to work with numbers is particularly important. For bank teller, hotel clerk, receptionist, and reservation and passenger agent jobs—jobs requiring constant contact with customers—employers seek persons who are pleasant, tactful, and outgoing.

Many employers prefer applicants who have some knowledge of office practices. High schools, community and junior colleges, business schools, and home study schools teach these skills. Business education programs typically include courses in typing, word processing, shorthand, clerk-typist skills, and office procedures. Work-study programs provide students with experience in a clerical job while still in school.

Whether or not they have had formal business training, beginning clerical workers generally receive on-the-job training. They learn how their employers keep records and become familiar with the kinds of business forms used. Workers may learn to operate duplicating machines, calculators, word processors, and personal computers, or learn stock handling or inventory control procedures.

The rapid spread of office automation has produced a demand for workers who are able to cope with change and adapt to new technologies. Secretaries and typists, for example, may periodically attend classes to learn to operate word processing equipment, information storage systems, and other automated equipment.

Opportunities for beginners to advance to other clerical occupations are good. Junior typists, for example, may be promoted to senior typists as their speed and accuracy improve. Receptionists who learn typing and office procedures may become secretaries. In large establishments, there may be opportunities to move into professional and managerial positions. Many employers facilitate career advancement by providing courses in skills needed for more demanding jobs. As workers become more highly skilled, they are assigned more difficult tasks. Promotion to such jobs as administrative assistant, office manager, or clerical supervisor generally depends on leadership ability, work experience, and knowledge of the organization.

A small but growing number of clerical workers belong to unions. The largest labor unions representing clerical workers include the American Federation of State, County, and Municipal Employees, the Service Employees International Union, the Communications Workers of America, and the Teamsters, as well as several Federal Government employee unions. 9 to 5, the National Association of Working Women, is a membership organization that represents the interests of nonunionized clerical workers.

Sources of Additional Information

The "Where to Go for More Information" section at the beginning of the *Handbook* identifies directories of schools offering courses in secretarial skills, accounting, business, data processing, and travel and tourism. For the names of organizations that can provide information about specific occupations, see the discussions of individual clerical occupations that follow.

Bank Tellers

(D.O.T. 211.362 except -010; 216.362-018; and 219.462-010)

Nature of the Work

Most bank customers have contact with the teller, the individual who cashes checks and processes deposits or withdrawals. Many banks employ one or two "all-purpose" tellers; larger banks employ tellers in more specialized functions. One specialized teller, for example, sells savings bonds; another accepts payment for customers' utility bills. A third receives deposits for Christmas club accounts; and a fourth keeps records and performs the necessary paperwork for customer loans. Others process the proliferating variety of certificates of deposit and money market accounts. Still other tellers handle foreign currencies, sell travelers' checks, or compute interest on savings accounts.

Commercial tellers, the most common kind of teller, cash customers' checks and handle deposits and withdrawals from checking and savings accounts. Before cashing a check, the teller must see that the written and numerical amounts agree, verify the identity of the person to receive payment, and be certain that the account has sufficient funds to cover the check. The teller must carefully count out the cash to avoid errors. Often a customer withdraws money in the form of a cashier's check, which the teller types up and verifies. When accepting a deposit, the teller checks the accuracy of the deposit slip and enters the total in a passbook or on a deposit receipt. Tellers may use machines to make change and total deposits. In most banks, tellers use computer terminals to record deposits and withdrawals. In some banks, they write deposit receipts and passbook entries by hand.

Tellers' duties begin before and continue after banking hours. They begin the day by receiving and counting an amount of working cash for their drawer; this amount is verified by a supervisor, usually the head teller. Tellers use this cash for payments during the day and are responsible for its safe and accurate handling. After banking hours, tellers count cash on hand, list the currency-received tickets on a settlement sheet, and balance the day's accounts. They also sort checks and deposit slips. Paying and receiving tellers may supervise one clerk or more.

Many tellers process the large number of transactions conducted by bank customers using the growing number of automatic teller machines (ATM's). During certain periods when ATM's are not available for customers' use, tellers replenish cash withdrawals, corroborate deposits, and update customers' accounts. When not balancing and settling ATM's, highly experienced tellers may occasionally assume the duties of customer service representatives, explaining the various types of accounts and financial services offered by their banks.

Working Conditions

Most tellers work during the day, Monday through Friday. Some tellers work evenings or weekends. The job also offers ample opportunity to work part time and flexible hours. Continual communication with customers, repetitive tasks, and prolonged standing within a fairly small area also characterize the job.

Many bank customers prefer the convenience of drive-up windows.

Employment

Bank tellers held about 493,000 jobs in 1984; about one-fifth worked part time. The following tabulation indicates the distribution of wage and salary jobs by type of banking or credit institution.

Banking	377,000
Commercial and stock savings banks	346,000
Mutual savings banks	28,000
Establishments closely related to banks	2,000
Credit agencies other than banks	116,000
Savings and loan associations	95,000
Personal credit institutions	21,000
Other credit agencies	1,000

Training, Other Qualifications, and Advancement

In hiring tellers, banks seek people who have good clerical skills and who are friendly and attentive. Most entrants transfer from other occupations; virtually all have at least a high school education. Maturity, neatness, tact, and courtesy are also important because customers deal with tellers far more frequently than with other bank employees. Although a teller works independently, his or her recordkeeping is closely supervised. One should enjoy working with numbers and feel comfortable handling large amounts of money.

New tellers usually learn their duties through on-the-job and formal training. They observe experienced workers for a few days before doing the work themselves. Training may last from a few days to 3 weeks or longer and, as experience is gained, includes instruction on equipment such as ATM's or on-line video terminals. Beginners usually start as commercial tellers; in large banks which have a separate savings teller's "cage," they may start as savings tellers. Often banks simultaneously train tellers for other clerical duties.

Experienced tellers may advance to head teller or customer service representative. Banks encourage this upward mobility by providing access to education and other sources of additional training. Outstanding tellers who have had some college or specialized training offered by the banking industry may be promoted to a managerial position. (See the statement on bank officers and managers elsewhere in the *Handbook.*)

Tellers can prepare for better jobs by taking courses accredited by the American Institute of Banking (AIB), an educational affiliate of the American Bankers Association; the Bank Administration Institute (BAI); and the Institute of Financial Education, an educational affiliate of the United States League of Savings Institutions. These institutes have several hundred chapters in cities across the country and numerous study groups in small communities. Most banks use the facilities of these institutes, which assist local banks in conducting cooperative training programs or developing independent training programs. Some banks have their own training programs which result in teller certification—a sign of competence in this field. Experienced tellers qualify for certification by taking required courses and passing examinations.

Job Outlook

The number of bank tellers is expected to increase more slowly than the average for all occupations through the mid-1990's because of the increasing use of automatic teller machines and other electronic equipment. Nevertheless, qualified applicants should have good prospects for both full-time and part-time employment, since this occupation provides a relatively large number of job openings.

The overwhelming majority of job openings for tellers are expected to be created by replacement needs—characteristic of occupations that generally require limited formal education and offer relatively low pay. Most tellers who leave transfer to other occupations. Others stop working—primarily to assume household duties. Cyclical swings in the economy seem to have little immediate effect on bank activities. Consequently, tellers are generally immune to layoffs.

Earnings

In 1984, average annual earnings of full-time tellers were $10,800. The lowest 10 percent earned about $8,000, while the top 10 percent earned about $17,200. In general, a greater range of responsibilities results in a higher salary. However, experience, length of service, and, especially, the location and size of the bank are also important.

Related Occupations

Tellers combine a knowledge of bank procedures with quickness and accuracy to process money, checks, and other financial items for customers. Other workers with similar duties include new accounts tellers, cashiers, toll collectors, post office clerks, auction clerks, and ticket sellers.

Sources of Additional Information

General information about banking occupations, training opportunities, and the banking industry itself is available from:

American Bankers Association, 1120 Connecticut Ave. NW., Washington, D.C. 20036.

Bank Administration Institute, 60 Gould Center, Rolling Meadows, Ill. 60008.

National Association of Bank Women, Inc., National Office, 500 N. Michigan Ave., Chicago, Ill. 60611.

The Institute of Financial Education, 111 E. Wacker Dr., Chicago, Ill. 60601.

Information on careers with the Federal Reserve System is available from:

Board of Governors, The Federal Reserve System, Personnel Division, Washington, D.C. 20551, or from the personnel department of the Federal Reserve bank serving each geographic area.

State bankers' associations can furnish specific information about job opportunities in their State. Or write directly to a particular bank to inquire about job openings. For the names and addresses of banks, savings, and related institutions, as well as the names of their principal officers, consult one of the following directories.

The American Bank Directory (Norcross, Ga., McFadden Business Publications).

Polk's World Bank Directory (Nashville, R.L. Polk & Co.).

Rand McNally International Bankers Directory (Chicago, Rand McNally & Co.).

The U.S. Savings and Loan Directory (Chicago, Rand McNally & Co.).

Bookkeepers and Accounting Clerks

(D.O.T. 209.687-010; 210.362, .367, .382 except -022 and -026; 214.362-018; 216.362 except -018 and -030, .367-010, .382 except -034, -042, -046, -050, -054, -062, and -066, .387, .482-010 and -026, and .587; 219.362-062 and -066, .387-018, .487, and .587; and 249.367-038)

Nature of the Work

Every business needs systematic and up-to-date records of accounts and business transactions. Bookkeepers and accounting clerks maintain these records in journals and ledgers or in the memory of a computer. They also prepare periodic financial statements showing all money received and paid out. The duties of bookkeepers and the "tools of the trade" vary with the size of the business. However, virtually all of these workers use calculating machines and many work with computers.

In many small firms, a general bookkeeper handles all the bookkeeping. He or she analyzes and records all financial transactions, such as orders and cash sales. General bookkeepers also check money taken in against money paid out to be sure accounts balance, calculate the firm's payroll, and make up employees' paychecks. General bookkeepers also prepare and mail customers' bills and answer telephone requests for information about orders and bills.

In large businesses, several bookkeepers and accounting clerks work under the direction of a head bookkeeper or accountant. In these organizations, bookkeeping workers often specialize in certain types of work. Some, for example, prepare statements of a company's income from sales or its daily operating expenses. Some enter information on accounts receivable and accounts payable into a computer and review computer printouts for accuracy and completeness. Others record business transactions, including payroll deductions and bills paid and due, and compute interest, rental, and freight charges. They also may type vouchers, invoices, and other financial records.

Working Conditions

For the most part, working conditions for bookkeepers and accounting clerks are the same as those for other office employees in the same company. Bookkeeping requires sitting for long periods and involves examining detailed numerical information. Some persons may find this tiring. Workers who operate older bookkeeping machines may be exposed to high noise levels. Newer equipment is relatively quiet, however. Bookkeepers and accounting clerks who spend a lot of time working on video display terminals may encounter problems of eyestrain, musculoskeletal strain, and stress.

Bookkeepers and accounting clerks sometimes work in teams.

Employment

Bookkeepers and accounting clerks held about 1,973,000 jobs in 1984. Jobs for bookkeepers are found throughout the economy—in business firms mostly, but also in schools, hospitals, nonprofit organizations, and government agencies. Approximately 1 bookkeeper in 3 works for a retail or wholesale firm. About a quarter of all bookkeepers and accounting clerks work part time.

Training, Other Qualifications, and Advancement

High school graduates who have taken business arithmetic, bookkeeping, and principles of accounting meet the minimum requirements for most bookkeeping jobs. Increasingly, employers prefer applicants who have completed accounting programs at the community or junior college level or those who have attended business school. The ability to use bookkeeping machines and computers is an asset. A knowledge of typing also is useful.

Training for this occupation is widely available. Bookkeeping is taught in high schools, community and junior colleges, and business schools and colleges. Business education programs typically include courses in bookkeeping and accounting, business arithmetic, office practices, and principles of data processing and computer operation for office workers. Some programs give business students an opportunity to learn on the job through work-study programs arranged by high schools and local businesses. Work experience, together with a firsthand knowledge of office procedures, can help when students look for jobs after graduation.

In a few States, bookkeepers and accounting clerks who work on tax returns must be licensed. State licensing agencies can provide information on the requirements in your area.

Bookkeepers need to be good at working with numbers and concentrating on details. Small mistakes can be very serious in this field, so bookkeepers need to be careful, accurate, and orderly in their work. Because they often work with others, bookkeepers should be cooperative and able to work as part of a team.

Beginning bookkeepers record routine transactions such as accounts receivable or accounts payable. As they gain experience, they advance to more responsible assignments, such as preparing income statements, reconciling accounts, and reviewing computer printouts.

Some bookkeepers are promoted to supervisory jobs. Others who enroll in college accounting programs may advance to jobs as accountants. Bookkeeping experience provides a good background for college courses in accounting but normally cannot be credited towards a degree in accounting.

Job Outlook

Employment of bookkeepers and accounting clerks is expected to grow more slowly than the average for all occupations through the mid-1990's. Job prospects should be good, nonetheless, in view of the large number of openings that will occur because of the need to replace workers who transfer to other occupations or stop working. As in most other clerical occupations, there is considerable movement into and out of the labor force due to homemaking responsibilities and relatively low wages. Since the occupation is exceptionally large, replacement needs produce numerous openings each year.

The volume of business transactions is expected to grow rapidly, with a corresponding increase in the need for financial and accounting records. However, the need for bookkeepers, who maintain these records, will not increase nearly as fast because of the increasing use of computers to record, store, and manipulate data.

Earnings

Beginning accounting clerks in private firms averaged $11,704 a year in 1984. Salaries are higher for more complex jobs, up to an average of $20,244 a year for top level accounting clerks.

Median annual earnings of full-time bookkeepers and accounting clerks were about $13,500 in 1984; the middle 50 percent earned between $11,200 and $17,700 a year. Ten percent earned less than $9,000 and 10 percent more than $23,200.

In 1985, the Federal Government paid accounting clerks with 2 years of experience or postsecondary education a starting salary of $12,862 a year.

According to a survey by the International Personnel Management Association, in 1984 the average beginning salary for accounting clerks in municipal, State, and Federal Government was $12,636 a year; the average salary for experienced workers was $16,248. An Administrative Management Society survey showed entry level accounting clerks averaged $13,832 a year in 1985, while accounting clerks with more responsibility averaged $16,484. Experienced bookkeepers in the private sector earned average annual salaries of $17,264 in 1985, according to a survey by the Executive Compensation Service.

Accounting clerks' salaries vary by industry. They tend to be highest in public utilities and mining and lowest in finance, insurance, and real estate.

Related Occupations

Workers in a number of other jobs also must be good at working with figures. Among such workers are bank tellers, collection workers, insurance clerks, and statistical clerks.

Sources of Additional Information

A brochure describing a career as a bookkeeper or accounting clerk is available upon request from:

Association of Independent Colleges and Schools, 1 Dupont Circle NW., Suite 350, Washington, D.C. 20036.

State employment service offices can provide information about job openings for bookkeeping workers.

Computer and Peripheral Equipment Operators

(D.O.T. 208.685-030; 213.362, .382, .582, .682, and .685)

Nature of the Work

Since their invention in the 1940's, computers have become steadily more important in our society. At first used only for military and scientific research, today computers are essential to the operation of stores, banks, colleges and universities, government agencies, hospitals, factories, and many other organizations. Like all machines, the usefulness of computers is dependent upon the skill of the people who run them.

The duties of computer and peripheral equipment operators vary with the size of the installation, the type of equipment used, and the policies of the employer. In organizations with small computer systems, for example, computer operators may run both the computer and all the peripheral equipment such as printers, disk drives, and tape readers. In large computer installations, computer operators specialize in console operation while peripheral equipment operators run the related devices. Generally, the duties of computer operators and peripheral equipment operators involve the following tasks.

Working from operating instructions prepared by programmers or operations managers, computer operators set controls on the computer and on peripheral devices required to run a particular job. Computer operators or, in large installations, peripheral equipment operators load the equipment with tapes, disks, and paper as needed. While the computer is running—which may be 24 hours a day for large computers—computer operators monitor the computer console and respond to operating and computer messages. If an error message occurs, for example, operators must locate the problem and solve it or terminate the program.

Peripheral equipment operators may have to prepare printouts and other output for distribution to computer users. Operators also maintain log books listing events such as machine malfunctions that occurred during their shift. Computer operators also may supervise and train peripheral equipment operators and computer operator trainees. They also may help programmers and systems analysts test and debug new programs. (Detailed descriptions of these occupations are presented elsewhere in the *Handbook*.)

Working Conditions

Computer operating personnel work in well-lighted, well-ventilated, and generally comfortable rooms. When the equipment is operating, however, the computer room can be noisy. Computer and peripheral equipment operators may be required to work evening or night shifts and weekends because many organizations use their computers 24 hours a day, 7 days a week.

Employment

In 1984, computer operators and peripheral equipment operators held 241,000 and 70,000 jobs, respectively. Although some jobs for computer and peripheral equipment operators are found in almost every industry, most are in government agencies, data processing service firms, banks, insurance firms, colleges and universities, and hospitals. These organizations have data processing needs that require large computer installations.

Training, Other Qualifications, and Advancement

In many firms, clerical workers such as secretaries, typists, bookkeeping clerks, and computer tape librarians may be transferred to jobs as peripheral equipment or computer operators and trained on the job. Employers who recruit from outside their firms look for workers who already have experience or training in operating the brand and type of equipment they use. Many high schools, public and private vocational schools, business schools, and community colleges offer training in computer operations. The military services also offer training.

Employers usually require a high school education, and many prefer computer operators with some trade school or junior college training in data processing. Employers who select operators from within their orga-

Preparing output for distribution is the responsibility of a peripheral equipment operator.

nization may pay for training at such schools. Many employers test applicants to determine their aptitude for computer work, particularly their ability to reason logically.

Workers usually receive some on-the-job training to become acquainted with their employer's equipment and routines. The length of training varies with the job and the experience of the worker. New peripheral equipment operators are expected to learn their jobs in a few weeks. New computer operators, however, may require several months of training because they must become sufficiently familiar with the computer equipment to handle all problems. Operators with prior experience or training are expected to learn their employer's system within a few weeks.

Because computer technology changes often, operators must be adaptable and willing to learn. Computer and peripheral equipment operators must be able to communicate well in order to work effectively with programmers and each other. Computer operators also must be able to work independently because they may have little or no supervision on evening, night, or weekend shifts.

A few computer operators may advance to supervisory jobs. Peripheral equipment operators may become computer operators. Through on-the-job experience and additional training, some computer and peripheral equipment operators advance to jobs as programmers.

Job Outlook

Employment of computer and peripheral equipment operators is expected to rise much faster than the average for all occupations through the mid-1990's.

Advances in technology have reduced both the size and the cost of computer equipment while at the same time increasing their capacity for data storage and processing. These improvements in technology have fueled an expansion in the use of computers in such areas as factory and office automation, telecommunications, medicine, and education. As computer usage grows, so will the need for computer operators and peripheral equipment operators. Because computer and peripheral equipment operators work mainly with large computer systems—the part of the overall computer market that has slowed down—employment of operators is not expected to rise as rapidly as in previous years.

In addition to jobs resulting from growth in demand for operators, many openings will arise from the need to replace workers who transfer to other occupations or leave the labor force.

Earnings

In 1984, median weekly earnings of full-time computer operators were $300. The middle 50 percent earned between $230 and $415. The lowest 10 percent of computer operators earned $190 or less a week, and the top 10 percent earned more than $540.

Weekly earnings of beginning computer operators averaged about $340 in 1984. Experienced workers averaged about $345, and lead operators about $415. Peripheral equipment operators earned about $325 a week. In the Federal Government, computer operators without work experience started at about $245 a week in 1985.

Computer operators and peripheral equipment operators had higher earnings in the North and West than in the South. Operators employed in manufacturing, transportation and public utilities, and wholesale trade had higher earnings than those employed in retail trade, banking, insurance, and services.

Related Occupations

Other occupations involving work with computers include systems analysts, programmers, and computer service technicians. Other occupations in which workers operate electronic office equipment include data entry keyers, secretaries, typists, and printing typesetters and compositors.

Sources of Additional Information

People who want further information about work opportunities in computer operations should contact firms that use computers such as banks, manufacturing and insurance firms, colleges and universities, and data processing service organizations. The local office of the State employment service is another source of information about employment and training opportunities.

Data Entry Keyers

(D.O.T. 203.582-022, -026, -030, -054, and -070)

Nature of the Work

Vast amounts of data stored and processed by modern computer systems must be updated almost continuously. Each time an individual writes a check, for example, the amount must be entered into the bank's computer, so the correct charge can be made to his or her account. Getting data from checks, bills, invoices, and other documents into the computer system is the work of data entry keyers.

The main function of the data entry keyer is to type data from documents quickly and accurately. This is done with a variety of typewriter-like equipment. Many keyers use a machine that converts the information they type to magnetic impulses on tapes or disks. The information is then read into the computer from the tape or disk. Some keyers operate on-line terminals of the main computer system that transmit and receive data. Although brands and models of computer terminals and data entry equipment differ somewhat, their operation and keyboards are similar.

Some keyers working from terminals use data from the computer to produce business, scientific, and technical reports. In some offices, keyers also operate computer peripheral equipment such as printers and tape readers, act as tape librarians, and perform other clerical duties.

Working Conditions

Data entry keyers usually work in offices that are clean, well lighted, and generally comfortable. However, they must sit for long periods and may be subjected to high noise levels. Keyers often work with video display terminals and may experience stress and eyestrain as a result. Data entry lends itself to flexible working arrangements, and many data entry keyers have part-time or temporary jobs.

Employment

Data entry keyers held about 324,000 jobs in 1984. Although jobs for data entry keyers are found in almost every industry, the largest number are in data processing service firms, government agencies, banks, insurance firms, colleges and universities, hospitals, and department stores. These organizations use computers to keep track of accounts, billings, inventories, and other items for which large amounts of data must be frequently updated.

Training, Other Qualifications, and Advancement

Employers usually require a high school education and the ability to key data at a certain speed. Applicants often are tested for speed and accuracy. Some employers prefer applicants with experience or training in the operation of data entry equipment. In some firms, other clerical workers such as tabulating and bookkeeping machine operators may be transferred to jobs as data entry keyers. Training in the use of data entry and similar keyboard equipment is available in high schools and private business schools.

Data entry keyers should be able to work under close supervision. They also must feel comfortable doing repetitive work.

Advancement opportunities for data entry keyers are limited. However, promotion to a supervisory position is possible after several years on the job. With additional training, often including community or junior college study, a few data entry keyers advance to jobs as computer or peripheral equipment operators.

Job Outlook

Little change is expected in employment of data entry operators through the mid-1990's. Despite the lack of employment growth, many openings, including part-time openings, will occur each year due to the need to replace workers who transfer to other occupations or leave the labor force.

The amount of data that must be entered into computer systems is tremendous and growing. Improvements to data processing technology and systems enable organizations to handle the growing volume of data with fewer data entry keyers. The use of on-line processing that enables departments within an organization to enter data from remote terminals is an example of such an improvement. Another is the use of recognition technologies such as the bar code scanners now used in many grocery stores. As improvements to communications systems allow data to be transmitted great distances cheaply and quickly, many firms may choose to locate data entry facilities out of the country in areas where wage rates are lower. If this occurs, the demand for data entry keyers could decline sharply.

Quick and accurate typing skills are essential for data entry keyers.

Earnings

In 1984, median weekly earnings of full-time data entry keyers were $255. The middle 50 percent earned between $220 and $330. The bottom 10 percent earned less than $185, while the top 10 percent earned more than $415 weekly.

Average weekly earnings of data entry keyers in private industry ranged from $250 to $300 in 1984. Keyers in the transportation and utilities industries and manufacturing had higher average earnings than those in trade and the financial and service industries. Keyers in the West and Midwest had higher average earnings than those in the Northeast and South. In the Federal Government, data entry keyers without work experience started at about $200 a week in 1985.

Related Occupations

Other occupations in which workers key in information on electronic office equipment include secretaries, typists, receptionists, and typesetters and compositors.

Sources of Additional Information

People who want further information about job opportunities in data entry should contact firms that use computers such as banks, manufacturing and insurance firms, colleges and universities, and data processing service organizations. The local office of the State employment service is another source of information about employment and training opportunities.

Mail Carriers and Postal Clerks

(D.O.T. 209.687-014; 230.363-010, .367-010; 239.367-018; and 243.367-014)

Nature of the Work

The United States Postal Service employs approximately 700,000 workers to move the Nation's mail. About four-fifths of these are mail carriers or postal clerks.

Most mail carriers travel planned routes delivering and collecting mail. Carriers start work at the post office early in the morning, where they spend a few hours arranging their mail for delivery and taking care of other details.

A carrier may cover the route on foot, by vehicle, or a combination of both. On foot, carriers carry a heavy load of mail in a satchel or push it in a cart. In some areas, they use a car or small truck. Residential carriers cover their routes only once a day, but some carriers assigned to a business district may make two trips a day. Deliveries are made house-to-house, to roadside mailboxes, and to large buildings, such as offices or apartments, which generally have all the mailboxes on the first floor.

Besides delivering and collecting mail, carriers collect money for postage-due and c.o.d. (cash on delivery) fees and obtain signed receipts for registered, certified, and insured mail. If a customer is not home, the carrier leaves a notice that tells where special mail is being held.

After completing their routes, carriers return to the post office with mail gathered from street collection boxes, homes, and businesses. They turn in the mail receipts and money collected during the day and may separate letters and parcels for further processing by clerks.

Many city carriers have more specialized duties. Some deliver only parcel post while others collect mail from street boxes and receiving boxes in office buildings. In contrast, rural carriers provide a wide variety of postal services. In addition to delivering and picking up mail, they sell stamps and money orders and accept parcels, letters, and items to be registered, certified, or insured.

All carriers answer customers' questions about postal regulations and services and provide change-of-address cards and other postal forms when requested.

Most people are familiar with the post office clerk behind the counter who sells stamps and accepts parcel post. However, most postal clerks are distribution clerks who sort incoming and outgoing mail in workrooms out of public view.

Postal clerks work at local post offices or at large central mail processing facilities. Those at local post offices sort local mail for delivery to individual customers and provide retail services. Incoming mail collected from local collection boxes is forwarded to the nearest mail processing center. There, clerks sort and prepare the mail for delivery.

About 514 mail processing centers throughout the country service post offices in surrounding areas. There, mailhandlers unload the sacks of incoming mail and separate it into groups of letters, parcel post, magazines, and newspapers. They feed letters through stamp-canceling machines, then take the mail to other workrooms to be sorted by postal clerks according to destination. There, clerks operating electronic letter sorting machines push keys corresponding to the ZIP code of the local post office to which each letter will be delivered; the machine drops letters into proper slots. Other clerks sort odd-sized letters, magazines, and newspapers by hand. Finally, the mail is sent to local post offices for further sorting according to delivery route.

In addition to selling stamps and money orders, clerks at post office windows weigh packages to determine postage and check to see if their condition is satisfactory for mailing. Clerks also register, certify, and insure mail and answer questions about postage rates, mailing restrictions, and other postal matters. Occasionally, they may help a customer file a claim for a damaged package.

Some postal clerks deal with the public directly.

Working Conditions

Most carriers begin work early in the morning, in some cases as early as 4 a.m. if they have routes in the business district. Carriers spend most of their time outdoors, and deliver mail in all kinds of weather. Even those who drive often must walk when making deliveries and must lift heavy sacks of parcel post when loading their vehicles.

A carrier's schedule has its advantages: Carriers who begin work early in the morning are through by early afternoon, and they spend most of the day on their own, relatively free from direct supervision.

Working conditions of clerks vary according to work assignments and the type of laborsaving machinery available. In small post offices, clerks may use a handtruck to move heavy mail sacks from one part of the building to another and sort mail by hand. In large post offices and mail processing centers, chutes and conveyors move the mail, and much of the sorting is done with machines. When not operating a letter sorting machine, clerks usually are on their feet, reaching for sacks and trays of mail and placing packages and bundles into sacks and trays.

Distribution clerks may become bored with the routine of sorting mail unless they try to improve their speed and accuracy. Many work at night or on weekends because most large post offices process mail around the clock, and the largest volume of mail is sorted during the evening and night shifts.

A window clerk, on the other hand, has a greater variety of duties, frequent contact with the public, and a generally less strenuous job, although they are held accountable for the assigned stamp stock and postal funds. Window clerks rarely have to work at night.

Employment

The U.S. Postal Service employed about 281,000 mail carriers and 317,000 postal clerks and mailhandlers in 1984. Three-quarters of them worked full time. Although most mail carriers worked in cities and suburban communities, about 71,000 were rural carriers. Most postal clerks work at mail processing centers, although some sort mail and provide window service at local post offices throughout the country.

Training, Other Qualifications, and Advancement

Mail carriers and postal clerks must be U.S. citizens or have been granted permanent resident-alien status in the United States. They must be at least 18 years old (or 16, if they have a high school diploma). They must qualify on a written examination that measures speed and accuracy at checking names and numbers and ability to memorize mail distribution procedures. Applicants must pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds. Applicants for mail carrier positions must have a driver's license, a good driving record, and pass a road test. Those applying for jobs as postal clerks operating an electronic sorting machine must pass a special examination which includes a machine aptitude test.

Applicants should apply at the post office or mail processing center where they wish to work to determine when an exam will be given. Applicants' names are listed in order of their examination scores. Five points are added to the score of an honorably discharged veteran, and 10 points to the score of a veteran wounded in combat or disabled. When a vacancy occurs, the appointing officer chooses 1 of the top 3 applicants; the rest of the names remain on the list to be considered for future openings until their eligibility expires, usually 2 years from the examination date.

Relatively few people under the age of 25 are hired as career mail carriers or postal clerks, a result of keen competition for these jobs and the customary waiting period of 1-2 years or more after passing the examination. It is not surprising, therefore, that most entrants transfer from other occupations.

Mail carriers and postal clerks are classified as casual, part-time flexible, part-time regular, or full time. Casual workers are not career employees, but are hired to help process and deliver mail during peak mailing or vacation periods of the year. Part-time flexible workers are career employees who do not have a regular work schedule or weekly guarantee of hours; they replace absent workers and help with extra work as the need arises. Part-time regulars have a set work schedule of less than 8 hours a day. Full-time postal employees work a 40-hour week over a 5-day period.

New mail carriers are trained on the job. They may begin as part-time flexible city carriers and become regular or full-time carriers in order of seniority as vacancies occur. Carriers can look forward to obtaining preferred routes as their seniority increases, or higher level jobs such as carrier technician, or promotion to supervisory positions.

New postal clerks also are trained on the job. Most clerks begin with simple tasks to learn regional groupings of States, cities, and ZIP codes. To help clerks learn these groups, many post offices offer classroom instruction.

A good memory, good coordination, and the ability to read rapidly and accurately are important. Distribution clerks work closely with other clerks, frequently under the tension and strain of meeting dispatch transportation deadlines. Window clerks must be courteous and tactful when dealing with the public, especially when answering questions or receiving complaints.

Most clerks begin as part-time flexible employees and become full-time workers in order of seniority as vacancies occur or to comply with staffing requirements. Full-time clerks may bid for preferred assignments such as the day shift, a window job, or a higher level nonsupervisory position as expediter or window service technician. Clerks also may advance to supervisory positions.

Job Outlook

In recent years, the number of applicants for mail carrier and postal clerk positions has greatly exceeded the number of openings. This situation is expected to continue, and persons seeking jobs in the Postal Service should anticipate keen competition.

Conflicting factors will influence the employment of mail carriers through the mid-1990's. On the one hand, despite competition from alternative delivery systems and new forms of electronic communication, the volume of mail handled by the Postal Service is expected to continue to grow, third class mail from businesses to households in particular. A growing population—and the even more rapidly growing number of households—will stimulate demand for mail deliveries. On the other hand, with the full implementation of the "ZIP + 4" routing program, mail carriers will spend less time sorting their mail before delivering it. In addition, the Postal Service is moving towards more centralized mail delivery, such as utilizing more cluster boxes, to cut down on the number of door-to-door deliveries. These trends are expected to have an offsetting effect, and employment of mail carriers is expected to remain stable.

Employment of postal clerks is expected to decline through the mid-1990's. In spite of the anticipated increase in the total volume of mail, automation will continue to raise postal clerks' productivity, and fewer will be needed. Postal clerks who sort the mail will be affected most. Automation in the Postal Service encompasses such things as the further implementation of computer forwarding, presorting programs, and the "ZIP + 4" routing program, as well as the installation of optical character readers, bar code sorters, and flat-sorting machines that mechanically process large envelopes, magazines, and circulars. These and other technological advances have already eliminated thousands of postal jobs. Little change is expected in the number of postal clerks who work at post office windows, although their productivity should increase as more electronic scales and computerized terminals are installed for their use. In addition, the proliferation of self-service stamp machines may tend to hold down the number of customers normally served by postal clerks.

Even though employment is not expected to increase, some jobs will be available because of the need to replace mail carriers and postal clerks who retire or stop working for other reasons. The factors that make entry to these occupations highly competitive—attractive salaries, a good pension plan, steady work, and modest educational requirements—contribute to a high degree of job attachment, so that replacement needs produce fewer job openings than in most other occupations. In contrast to the typical pattern, postal workers generally remain in their jobs until they retire; relatively few transfer to other occupations.

Although the volume of mail to be processed and delivered rises and falls with the level of business activity, as well as with the season of the year, full-time mail carriers and postal clerks have, to date, never been laid off. When mail volume is high, full-time carriers and clerks work overtime, part-time carriers and clerks work additional hours, and casual carriers and clerks may be hired. When mail volume is low, overtime is curtailed, part-timers work fewer hours, and casual workers are discharged. The projected long-term employment decline of postal clerks probably will not cause layoffs of permanent workers, but will be achieved by elimination of some positions vacated by workers who leave voluntarily, as was the case during the 1970's.

Earnings

In early 1985, experienced, full-time, city delivery mail carriers earned an average salary of $24,528 a year, about one and one-half times the average earnings for all nonsupervisory workers in private industry, except farming. For full-time carriers and postal clerks, base pay for beginners was $18,532 a year, rising to a maximum of $25,117 after 10 1/2 years. A 10-percent supplement is paid for hours worked between 6 p.m. and 6 a.m. Carriers and postal clerks working part-time flexible schedules began at $9.20 an hour in early 1985, with periodic increases up to $12.48 an hour after 10 1/2 years.

Rural delivery carriers had average base salaries of $24,712 in early 1985. Their earnings are determined through an evaluation of the amount of work required to service their routes. Carriers with heavier workloads generally earned more than those with lighter workloads. Rural carriers also received a maintenance allowance when required to use their own vehicles.

Most mail carriers and postal clerks belong to 1 of the 4 unions organizing postal workers: American Postal Workers Union, National Association of Letter Carriers, National Post Office Mail Handlers, and National Rural Letter Carriers Association.

Related Occupations

Mail carriers, mailhandlers, and postal clerks play an important role in moving the Nation's mail, and their work and qualifications are closely related. Other occupations with duties related to those of mail carrier include messengers, merchandise deliverers, and delivery-route truckdrivers. Other occupations whose duties are related to those of postal clerk include mail clerks, file clerks, routing clerks, sorters, medical record clerks, clerk-typists, cashiers, data entry operators, and ticket sellers.

Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and specific employment opportunities for mail carriers and postal clerks.

Receptionists and Information Clerks

(D.O.T. 203.362-014; 205.367-038; 237.267-010, .367-010, -018, -022, -026, -038, -042, -046, and -050; 238.367-022 and -034; and 249.262-010 and .367-082)

Nature of the Work

All organizations want to make a good first impression on the public. This is an important part of the job of the receptionist or information clerk, who generally is the first person a caller sees or speaks to.

Receptionists and information clerks greet customers and other visitors, determine their needs, and refer callers to the person who can help them. They also answer questions from the public. Their day-to-day duties vary a great deal, depending on where they work. Those in hospitals and doctors' offices, for example, may obtain personal and financial information and then direct patients to the proper waiting rooms. In beauty shops, they arrange appointments and may show customers to the operator's booth. In factories or large business firms, they provide identification cards and arrange for escorts to take callers to the proper office. Those working for bus and train companies respond to inquiries about departures, arrivals, stops, and the like.

Many receptionists and information clerks keep records of callers, the times at which they called, and the persons to whom they were referred. When they are not busy with callers, they may perform clerical duties, such as typing or filing. Some open and sort mail and collect and distribute messages. Still others prepare travel vouchers and do simple bookkeeping.

Often receptionists, particularly those in large cities, have a security function—seeing who belongs in a given place and who does not. They may be expected to monitor the attendance of other employees and report this to management.

Increasingly, receptionists and information clerks use automated office equipment such as word processors or personal computers in the course of their work. While this equipment allows them to handle more messages, for example, it does not alter the basic content of their job—human contact and interaction. That is something that even the most sophisticated machine cannot replace.

Working Conditions

Because receptionists and information clerks greet customers and visitors, they usually work in areas that are carefully designed and furnished to make a good impression. Working conditions usually are pleasant; offices are clean, well lighted, and relatively quiet.

Although most have regular hours, receptionists and information clerks in hospitals and some professional offices may work weekends or in the evenings. About a third of all receptionists work part time.

Employment

Receptionists and information clerks held about 458,000 jobs in 1984. Nearly half of all jobs are located in health-related facilities of various kinds: Doctors' and dentists' offices, hospitals, nursing homes, urgent care cen-

Receptionists must be attentive.

ters, surgicenters, clinics, and so forth. Factories, wholesale and retail stores, real estate offices, and firms providing business and personal services also employ large numbers of receptionists and information clerks.

Training, Other Qualifications, and Advancement

Many receptionist and information clerk jobs are entry level and do not require office or business experience. The occupation accordingly attracts people outside the labor force, including homemakers and recent high school and college graduates. Employers usually require a high school diploma, and some require typing and other general office skills.

Personal characteristics are very important in this occupation. Receptionists and information clerks should like meeting new people and have a desire to be helpful and informative. A neat appearance, a pleasant voice, and an even disposition also are important. Because receptionists and information clerks do not work under close supervision, common sense and a thorough understanding of how the business is organized help them handle various situations that arise.

Promotion opportunities for these workers are limited, especially in small offices. In large workplaces, however, a receptionist or information clerk who has clerical skills may advance to a better paying job as a secretary, administrative assistant, or bookkeeper.

English, typing, shorthand, business arithmetic, basic accounting and bookkeeping, office procedures, and other useful subjects for receptionists and information clerks are taught in high schools throughout the country. College or business school training also can be helpful in advancing to better paying office jobs. Many companies have their own training programs so that the skills needed for advancement can be learned on the job.

Job Outlook

Employment of receptionists and information clerks is expected to grow about as fast as the average for all occupations through the mid-1990's. Although many openings will occur as businesses expand, most jobs for receptionists and information clerks will result from the need to replace experienced workers who transfer to other jobs or stop working altogether. As in the past, replacement needs will create an exceptionally large number of job openings, for the occupation is large and turnover is higher than average. Many opportunities for part-time work will be available.

Employment of receptionists and information clerks is expected to grow more rapidly than employment of clerical workers in general. This is largely because so many receptionists and information clerks work for firms providing business and professional services—sectors of the economy that are expected to continue to show strong growth—particularly doctors' and dentists' offices, law firms, and consulting firms. In addition, more and more firms recognize the importance of these workers in promoting good public relations. Because the work of receptionists and information clerks is of a person-to-person nature, it is unlikely to be affected by office automation. In addition, because establishments need their services even in hard economic times, receptionists and information clerks usually are not subject to layoffs during recessions.

Since many receptionists and information clerks also perform secretarial duties, persons with good typing, stenographic, and other skills should have the best job prospects.

Earnings

Receptionists in the private sector averaged $13,780 a year in 1985, according to a survey by the Executive Compensation Service. In 1985, the Federal Government paid beginning information receptionists with a high school diploma or 6 months of work experience $10,501 a year. Average salaries for information receptionists employed by the Federal Government were about $13,800 a year in 1984.

Median annual earnings of full-time receptionists were about $11,700 in 1984; the middle 50 percent earned between $9,900 and $14,600 a year. Ten percent earned less than $8,200 and 10 percent more than $17,900.

Related Occupations

A number of other workers deal with the public, receive and provide information, or direct people to others who can assist them. Among these are customer-service representatives, dispatchers, hotel clerks, reservation agents, and telephone operators.

Sources of Additional Information

State employment service offices can provide information about earnings, hours, and employment opportunities in this and other clerical jobs.

Reservation and Transportation Ticket Agents and Travel Clerks

(D.O.T. 214.362-030; 238.167-010 and -014, .362-014, .367 except -022, and 248.382-010)

Nature of the Work

The manner in which a company's employees deal with the public, and the quality of the service they provide, often make the difference between a satisfied customer and a dissatisfied one. In transportation companies, reservation and transportation ticket agents and travel clerks provide this important personal contact.

Reservation and transportation ticket agents and travel clerks are employed by airline, railroad, bus, and steamship companies, automobile clubs, hotels, government agencies, and business firms to facilitate passenger travel in a variety of ways. They help passengers plan their trips by answering questions and offering suggestions on travel arrangements such as routes, time schedules, rates, and types of accommodation. They make and confirm reservations, calculate expenses, and write and sell tickets. When passengers are about to embark on their trips, these agents and clerks check their baggage, direct them to the point of departure, and help them to board.

Airlines employ reservation agents, gate agents, and ticketing clerks. Airline reservation agents work in large central offices answering customer telephone inquiries and booking reservations. Each agent has access to a computer terminal and, by typing instructions on the keyboard, can quickly obtain the necessary information and make the reservations. Agents also can change or cancel reservations at the customer's request, simply by modifying the record on the computer. Airline ticketing clerks compile and record information to assemble airline tickets which then are sent to passengers. Airline gate agents work in airports and assist passengers to board the correct airplane. Their duties include checking flight tickets, directing passengers to the right boarding area, allowing passengers to board the airplane, and assisting elderly, disabled, or young passengers to board or depart from the airplane.

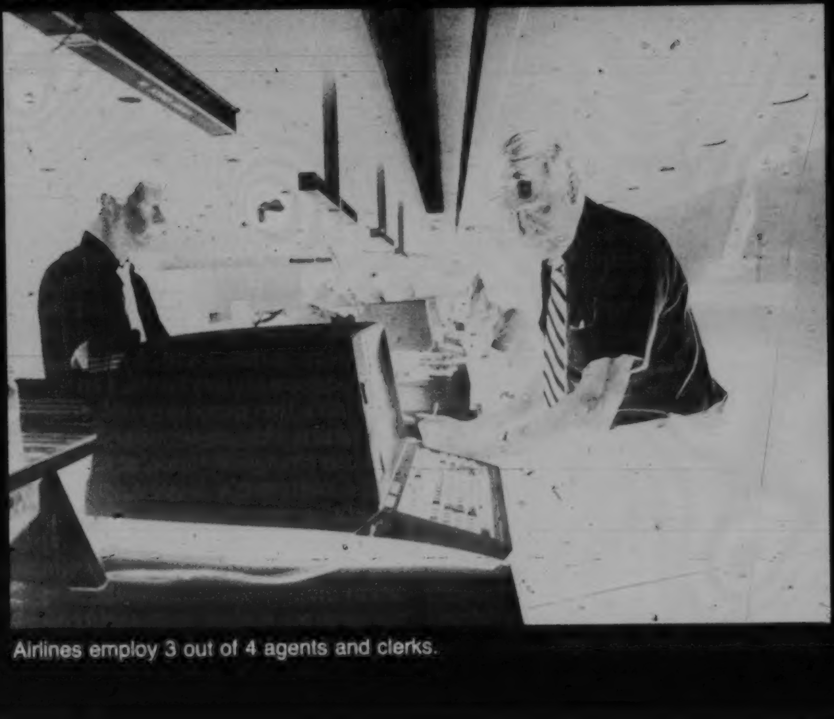
Airlines, as well as railroad, bus, and steamship companies, also employ ticket agents (sometimes referred to by other titles, such as passenger agent, passenger-booking clerk, reservation clerk, ticket clerk, and ticket seller). In addition to selling tickets, these workers answer inquiries, plan routes, ensure passenger seating, check baggage, and sell travel insurance.

Railroads employ reservation clerks to handle customers' requests for passenger space on trains. They assign space after consulting the chart diagram of each car, and then make the proper arrangements with other company employees to ensure that passengers can complete their trips smoothly.

Passenger rate clerks work for bus companies. They arrange charter trips by providing fares to customers, planning travel routes, computing rates, and keeping customers informed of appropriate details. They may also arrange travel accommodations for tourists.

Automobile clubs have travel clerks, often called travel counselors, who plan trips for club members. Using a road map, they show the best route from the point of origin to the destination, as well as the return. They indicate the points of interest, restaurants, hotels, or other housing accommodations along the route and explain what emergency repair services are available during the trip. They may make reservations for club members and calculate expenses and mileage.

Travel clerks also work in other settings, such as hotels and motels, business firms, and government agencies. When guests or employees are planning trips, travel clerks assist them by providing the appropriate literature and information, answering questions, and offering suggestions. They may make reservations, pick up and deliver tickets, arrange for visas, and make any other arrangements necessary for a safe and productive trip.



Airlines employ 3 out of 4 agents and clerks.

Working Conditions

Because the transportation industry operates at all hours, reservation and transportation ticket agents and travel clerks may have irregular schedules. Agents and clerks with the least seniority often work nights and weekends. Reservation agents in central offices making reservations by telephone generally sit while on duty. Ticket agents in transportation terminals dealing face-to-face with passengers, however, usually stand most of the time. In contrast to most other clerical occupations, there is little part-time work in these jobs.

During holidays and other busy periods, agents and clerks may find the work hectic due to the large number of passengers who must be accommodated rapidly. When operations are interrupted, when weather conditions or strikes lead to delays or cancellation of airplane flights, for example, agents and clerks serve as buffers between the companies and their customers. Trying to pacify irate passengers under these conditions can be very difficult.

Employment

Reservation and transportation ticket agents and travel clerks held about 109,000 jobs in 1984. Airlines provided 3 out of 4 jobs. The rest were provided by automobile clubs (about 6,000), railroad companies (nearly 5,000), bus companies (almost 4,000), and water transportation companies (approximately 1,000). Most agents and clerks worked in downtown ticket and reservation offices and at large metropolitan transportation terminals where most passenger business originates. Some were employed in smaller communities served by transportation companies.

Training, Other Qualifications, and Advancement

Hiring requirements vary from company to company within the transportation industry. High school graduation generally is required and often some college is preferred. In fact, compared to other clerical occupations, a higher-than-average percentage of persons entering these occupations have attended college. While the airline industry has traditionally drawn jobseekers who have had some college education, passenger service jobs throughout the transportation industry are being sought more often by college graduates as competition closes off other job opportunities.

Previous experience dealing with the public, prior employment in the transportation industry, or both, may pave the way to a passenger service job. The majority of openings are filled by persons in their twenties or thirties, many of whom transfer from other occupations, although there are no age restrictions. Because reservation and transportation ticket agents and travel clerks must deal directly with the public, a good appearance and a pleasant personality are important, as are problemsolving ability and good interpersonal skills. A good speaking voice is essential because these employees frequently use the telephone or public address system. Courses useful to persons wanting to enter these occupations include basic math and English, geography, U.S. history, and public speaking. Typing ability often is needed and experience with word processing equipment and computers usually is useful.

Orientation and training for new reservation and transportation ticket agents and travel clerks vary with the company. In some cases, formal instruction is given, whereas in other cases, all the training is given on the job. In airlines, for example, new reservation agents receive about a month of classroom instruction. They are taught company policy and government regulations that cover ticketing procedures and other matters related to the airline. They learn to read schedules, calculate fares, and plan passenger itineraries. They also are taught to use the computer to obtain information on schedules and seat availability, and to reserve space for passengers. They are tested daily and homework usually is assigned. To maximize their productivity, reservation agents are expected to minimize the time spent on each call without, of course, alienating customers. It takes practice to cut off garrulous callers without offending them. Thus, learning how to carry on conversations in an organized, yet pleasing manner is an important part of their training. After completing classroom instruction, new agents work under supervisors or experienced agents for several weeks. On the other hand, automobile clubs train their travel clerks on the job, without formal classes.

Advancement opportunities are limited. Some reservation and transportation ticket agents and travel clerks are promoted to supervisory positions, and a small number eventually become field sales agents or city and district sales managers. In unionized establishments, entry level positions may be the only ones open to individuals outside the firm; higher level positions are generally filled through promotion from the ranks of company employees.

Job Outlook

Employment of reservation and transportation ticket agents and travel clerks is expected to grow more slowly than the average for all occupations through the mid-1990's. A growing and more travel-oriented population will increase the demand for transportation services. However, automation—in particular, computerization—and other productivity improvements by transportation companies will constrain the growth in employment of reservation and transportation ticket agents and travel clerks.

Most job openings will arise as experienced agents and clerks transfer to other jobs or leave the labor force. Applicants are likely to encounter considerable competition for openings, for the supply of qualified applicants far outstrips demand. For one thing, many people satisfy the entry requirements. Moreover, airline jobs, in particular, attract many applicants because of the travel benefits for almost all the employees and the glamour associated with the industry.

Employment of reservation and transportation ticket agents and travel clerks is sensitive to cyclical swings in the economy. Some agents and clerks are likely to be laid off or demoted during recessions, when demand for passenger travel declines and few new agents and clerks are hired.

Earnings

According to a Bureau of Labor Statistics survey of the airline industry, reservation agents earned average weekly salaries of $449 in 1984, while gate agents averaged $482 and ticket agents, $510. AMTRAK paid reservation clerks between $8.85 and $11.06 an hour in 1985, and ticket clerks received $9.44 to $11.80. According to a union contract, a major bus company in 1984 paid its telephone information clerks hourly rates ranging from $7.01 to $8.83, while ticket agents were paid from $7.52 to $9.35. In 1985, travel clerks working for a national automobile club earned starting salaries of $208 to $231 a week; after a few years' experience, travel clerks averaged between $240 and $269, with a top salary of $392. Fringe benefits for agents and clerks often include discounts on travel on their company's carriers for themselves and their immediate families.

Many agents and clerks belong to labor unions. Five unions cover most of the organized agents and clerks: The Air Line Employees Association; the Amalgamated Transit Union; the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employes; the International Brotherhood of Teamsters, Chaffeurs, Warehousemen and Helpers of America; and the Transport Workers Union of America.

Related Occupations

Other workers who must be friendly and pleasant while providing information or assisting people include ground hosts/hostesses (air transportation), appointment clerks, information clerks, and receptionists.

Sources of Additional Information

Information about jobs in a particular transportation company may be obtained by writing to the personnel manager of the company. Addresses of airlines are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

Secretaries

(D.O.T. 201)

Nature of the Work

The efficiency of any organization depends in part upon *secretaries*, who are at the center of communications within the firm. They process and transmit information to the staff and to other organizations.

Secretaries perform a variety of administrative and clerical duties that are necessary to run and maintain organizations efficiently. They schedule appointments, give information to callers, organize and maintain files, fill out forms, and take and transcribe dictation. The amount of time secretaries spend on these and other duties—including typing—depends on the way office work is handled within the organization.

In offices that have word processing centers, *administrative secretaries* handle everything except dictation and typing. Their duties range from filing, routing mail, and answering telephones to more complex work such as answering letters, doing research, and preparing statistical reports. Administrative secretaries sometimes work in clusters of three or four so that they can help each other. Because they are released from dictation and typing, they can serve several members of the professional staff.

Some secretaries do highly specialized work for which training is available in business schools and colleges as well as community colleges. *Legal secretaries* (D.O.T. 201.362-010) prepare legal papers and correspondence such as summonses, complaints, motions, and subpoenas. They may also review law journals and assist in other ways with legal research. *Medical secretaries* (D.O.T. 201.362-014) transcribe dictation, prepare correspondence, and assist physicians or medical scientists with reports, speeches, articles, and conference proceedings. They need to know medical terminology and be familiar with hospital or laboratory procedures. *Technical secretaries* assist engineers or scientists. In addition to the usual secretarial duties, they may prepare much of the correspondence, maintain the technical library, and gather and edit materials for scientific papers.

Another specialized secretary is the *social secretary* (D.O.T. 201.162-010), sometimes called a personal secretary, who arranges social functions, answers personal correspondence, and keeps the employer informed about all social activities. *Membership secretaries* (D.O.T.201.362-018) compile and maintain membership lists, record the receipt of dues and contributions, and give out information to members of organizations and associations. They may have such other duties as sending out newsletters and promotional materials. *School secretaries* (D.O.T. 201.362-022) handle secretarial duties in elementary and secondary schools; they may take care of correspondence, prepare bulletins and reports, keep track of money for school supplies and student activities, and maintain a calendar of school events.

Typing is only one of a secretary's duties.

Working Conditions

Secretaries usually work in offices that are clean and free from high noise levels except during peak typing periods. Their jobs often involve sitting for long periods, and typing often requires working from materials that are difficult to read. If they spend a lot of time at a video display terminal, they may encounter problems of eyestrain, musculoskeletal strain, and stress. Executive secretaries, who perform a number of duties, have the variety in their jobs that many people prefer.

Secretaries generally work a standard 40-hour week. In some cities, especially in the Northeast, the scheduled workweek is 37 hours or less.

Office work lends itself to alternative or flexible working arrangements, and many secretaries hold part-time or temporary jobs. A few participate in job-sharing arrangements, in which two people divide responsibility for a single job.

Employment

Secretaries held about 2,797,000 jobs in 1984, making this one of the largest occupations in the U.S. economy.

Secretaries are employed in organizations of every description. They work for firms that engage in manufacturing, mining, construction, wholesale and retail trade, transportation, and communications. Banks, insurance companies, investment firms, and real estate firms are important employers, as are Federal, State, and local government agencies. Almost half of all secretaries are employed in educational institutions, hospitals and other health facilities, law firms, membership organizations, and companies that provide business services. Among the latter are temporary help agencies and word processing service bureaus.

Training, Other Qualifications, and Advancement

High school graduates qualify for most secretarial positions provided they have basic office skills. Secretaries must be proficient in typing and good at spelling, punctuation, grammar, and oral communication. Shorthand is necessary for some positions. Word processing experience is increasingly important and more and more employers require it.

The skills needed for a secretarial job can be acquired in various ways. Although formal training or refresher courses are not essential for most jobs, training is an asset and may lead to higher paying jobs. Secretarial training ranges from high school vocational education programs that teach office practices, shorthand, and typing to 1- to 2-year programs in secretarial science offered by business schools, vocational-technical institutes, and community colleges.

In addition to a solid grounding in secretarial skills, employers look for a good command of the English language and an aptitude for numbers. Some firms look for individuals with excellent interpersonal skills, since secretaries must be tactful in their dealings with many different people. Discretion, judgment, organizational ability, and initiative are important for the more responsible secretarial positions.

Continuing changes in the office environment, many made possible by the computer, have increased the demand for secretaries who are adaptable and versatile. Workers must be prepared to be retrained whenever an employer introduces new equipment. Secretaries may have to attend classes to learn to operate word processing equipment, information storage systems, personal computers, and other automated office equipment. Sometimes, they must acquire this training at their own expense. The frequency with which such equipment is changed or updated makes retraining and continuing education an integral part of the job, and employers seek workers who understand and accept the inevitability of change.

Advancement for secretaries generally comes about in one of two ways: Promotion to more responsible secretarial positions, or transfer to another kind of job. As secretaries gain experience, they can qualify for the designation Certified Professional Secretary (CPS) by passing a series of exams given by the Institute for Certifying Secretaries, a department of Professional Secretaries International. This designation is recognized by a growing number of employers as the mark of achievement in the secretarial field.

Qualified secretaries who broaden their knowledge of their company's operations may be promoted to positions such as administrative assistant, clerical or secretarial supervisor, and office manager. By taking college courses or completing a degree program in a field such as business, marketing, accounting, or personnel administration, secretaries may progress into entry level management positions. Training in computing skills is an increasingly important factor in promotions.

Secretaries with word processing experience can advance to jobs as word processing trainers, supervisors, or managers within their own firms or in a secretarial or word processing service bureau. They also can get jobs with manufacturers of word processing and other office equipment in positions such as instructor or sales representative.

Job Outlook

Employment of secretaries is expected to grow more slowly than the average for all occupations through the mid-1990's due to productivity gains made possible by office automation. In firms that have invested in word processors or personal computers, secretaries can turn out significantly more work than they did in the past, when they used typewriters.

While office automation is "old hat" in large firms, that is not yet the case in small businesses. Many small business owners are reluctant to invest in costly, unfamiliar equipment and software programs. Manufacturers and retailers, however, are taking steps to make automated office equipment "user friendly." Once cost and psychological barriers are overcome, expanded use of word processing equipment in the small business sector is likely to dampen demand for secretaries. This could cause employment to level off by the mid-1990's instead of growing slowly.

Long-term job growth will also be affected by new office technologies such as electronic mail and voice message systems. Widespread implementation of these technologies is not expected before the late 1990's. When that happens, however, demand for secretaries will be further constrained.

Widespread use of automated equipment is changing the way administrative support is handled in many offices, leading to reassignment of job duties and restructuring of entire departments. Large firms are experimenting with different methods of staffing their administrative support operations. In some cases, such traditional secretarial duties as typing, filing, copying, and accounting are being assigned to workers in other units or departments. In some law offices and physicians' offices, paralegals and medical assistants are taking over some secretarial duties. In addition, there is a trend in many offices for groups of professionals and managers to "share" secretaries, as opposed to the traditional practice of having one secretary work for only one professional or manager.

Developments in office technology are certain to continue, and they will bring about further changes in the secretary's work environment. However, many of a secretary's job duties are of an administrative nature—such as scheduling conferences, making travel arrangements, and transmitting staff instructions—and hence not subject to being automated. Because automated equipment cannot substitute for the personal skills that are essential to the job, the need for secretaries will continue.

Despite the slower than average growth expected in this occupation, an exceptionally large number of jobs will be available through the mid-1990's due to the need to replace experienced secretaries who transfer to other jobs or stop working. As in most other occupations, replacement needs will be the primary source of jobs.

Earnings

Secretaries' salaries vary a great deal, usually reflecting differences in skill, experience, and level of responsibility.

Salaries in different parts of the country also vary; earnings generally are lowest in southern cities and highest in northern and western urban areas. In 1984, for example, secretaries averaged $18,148 a year in the Northeast, $18,720 in the North Central region, $19,838 in the West, and $17,602 in the South.

In addition, salaries vary by industry. Salaries of secretaries tend to be highest in public utilities and mining and lowest in retail trade and finance, insurance, and real estate.

Secretaries to supervisors in small offices averaged $15,296 a year in 1984. Secretaries to officers in small companies had an average yearly salary of $16,920; those working for middle management in large companies averaged $19,053. Secretaries holding greater responsibilities, such as executive secretaries to corporate officers, earned an average salary of $21,525 per year.

Starting salaries for secretaries in the Federal Government ranged from $11,458 to $17,824 a year in 1985, depending on education, skills, and experience. Secretaries employed by the Federal Government in 1984 had average annual salaries of about $17,000.

The average beginning salary for secretaries in municipal, State, and Federal government was $13,956 a year in 1984, according to a survey by the International Personnel Management Association. The average salary for experienced secretaries was $18,012. Legal secretaries in the private sector averaged $18,564 a year in 1985, according to an Executive Compensation Service survey; bilingual secretaries averaged $17,784.

Employers usually pay secretaries who have word processing experience higher salaries than those without such experience.

Most secretaries in large cities receive 7 paid holidays or more a year and a 2-week vacation after working 1 year. With added years of service, vacations may range to 4 weeks or more. Group life and health insurance, pension plans, and other benefits often are provided.

Related Occupations

A number of other workers type, record information, and process paperwork. Among these are bookkeepers, receptionists, stenographers, office managers, personnel clerks, typists, administrative assistants, legal assistants, medical assistants, and medical record technicians.

Sources of Additional Information

For career information, write to:

Professional Secretaries International, 301 East Armour Blvd., Kansas City, Mo. 64111.

High school students interested in careers as legal secretaries may request the pamphlet *So You Want To Be A Legal Secretary*. Write to:

National Association of Legal Secretaries

(International), 3005 East Skelly Dr., Suite 211,
Tulsa, Okla. 74105.

Brochures describing a career as a secretary or legal secretary are available upon request from:

Association of Independent Colleges and
Schools, 1 Dupont Circle, NW., Suite 350,
Washington, D.C. 20036.

State employment offices can provide information about job openings for secretaries locally and nationwide.

Statistical Clerks

(D.O.T. 209.387-014, 214.487-010, 216.382-062 and -066, 219.387-022, 221.382-010 and .584-010, and 245.362-010)

Nature of the Work

Managers and administrators in organizations of all kinds depend on information to make decisions. Statistical clerks help develop such information. In particular, they put together records that primarily involve numbers, and help ensure that those numbers are complete and accurate. Although the occupational title "statistical clerk" covers a number of different jobs, all of them can be grouped into three categories: Recording, compiling and coding, and computing and tabulating.

Recording. This work involves collecting and verifying the accuracy of information. *Chart changers* (D.O.T. 221.584-010) change charts and record data from industrial recording instruments, such as pyrometers and flowmeters.

Compiling and coding. In organizations of all types, information must be properly filed, verified, or prepared for data processing. *Compilers* (D.O.T. 209.387-014) compile directories, survey findings, opinion polls, and census reports from data obtained from surveys or censuses. *Medical-record clerks* (D.O.T. 245.362-010) compile, check, and file medical records of hospital or clinic patients and compile statistics for use in reports and surveys.

Computing and tabulating. Organizations frequently use numerical records for reports and research. Statistical clerks gather information from records to present in a graph or table for analysis. *Actuarial clerks* (D.O.T. 216.382-062) use formulas, statistical tables, and insurance rate books to assist actuaries in determining insurance rates for company customers. They also prepare graphs and tables for studies on general insurance practices. *Statistical clerks* (D.O.T. 216.382-062) are employed by government agencies, business firms, health care facilities, and research organizations to calculate numerical data and prepare graphs and tables on topics such as population, housing, health, and business conditions. *Advertising statistical clerks* (D.O.T. 216.382-066) use calculating and adding machines to tabulate statistical records for companies on the cost, volume, and effectiveness of their advertising. *Chart calculators* (D.O.T. 214.487-010) work for power companies. They compute the power factor and net amount of electric power consumed by the company's commercial customers and determine the peak load demand to verify the application of the appropriate rates. *Chart clerks* (D.O.T. 221.382-010) use tools such as adding machines and calculators to extract statistical data from graphs taken from flowmeters and other measuring and recording devices used on pipelines. *Planimeter operators* (D.O.T. 219.387-022) are government employees who determine acreage by using a planimeter to trace the boundary lines of land plots on aerial photographs.

Statistical clerks use computers to compile, compute, and tabulate data.

Working Conditions

Most statistical clerks are employed in offices where working conditions generally are good. Work areas usually are clean, well lighted, and free from loud noises. Statistical clerks who work at video display terminals may encounter problems of eyestrain, musculoskeletal strain, and stress.

Employment

Statistical clerks held about 93,000 jobs in 1984. Although these jobs are found in nearly every sector of the economy, over half are in telephone communications; finance, insurance, and real estate; hospitals; and government agencies.

Jobs for statistical clerks are concentrated in major metropolitan areas that are centers of commercial, financial, and government activities.

Training, Other Qualifications, and Advancement

Most employers prefer to hire high school graduates for statistical clerk jobs. They seek applicants who have an aptitude for working with numbers and the ability to do detailed work. High school students may prepare for jobs as statistical clerks by taking courses in general mathematics, algebra, and geometry. Also recommended are courses in data processing, office procedures, bookkeeping, and typing.

In many companies, general clerks who have become familiar with their employers' record systems and office procedures are promoted to statistical clerk positions. On-the-job training may include the use of calculators, tabulating machines, typewriters, and personal computers.

Statistical clerks must be familiar with the items or information they observe and record. In preparing data for processing, coding clerks must use the proper computer codes to avoid errors.

Statistical clerks should be able to do prompt and accurate work under close supervision. Also, they should be tactful and even tempered when working with others in the same office.

Most employers follow a promotion-from-within policy that allows experienced workers to qualify for more responsible jobs as they become available. Qualified statistical clerks may perform more difficult assignments or advance to supervisory positions. Some statistical clerks are able to advance to a technician level where they may deal with the technical problems of statistical research projects. Some clerks move into computer-related occupations.

Job Outlook

Employment of statistical clerks is expected to decline through the mid-1990's. While the amount of statistical data to be processed is expected to increase substantially, particularly in the area of finance and insurance, the tremendous productivity gains associated with advances in information and data management techniques will mean that fewer statistical clerks will be needed. Many of the routine tasks performed by statistical clerks can be handled more quickly and more accurately by computers, and the application of computer technology to recordkeeping, data retrieval, and analysis is widespread and growing.

The rapid pace of change has revolutionized the work environment as traditional ways of handling data have given way to computer-based methods. As professional workers and managers increasingly use personal computers and other automated office equipment, they are performing tasks traditionally delegated to statistical clerks or research assistants, thus reducing demand for these workers. This trend is expected to continue.

In spite of the expected drop in employment, there will be some openings due to replacement needs.

Earnings

Median annual earnings of full-time statistical clerks were about $17,400 in 1984; the middle 50 percent earned between $13,900 and $23,000 a year. Ten percent earned less than $10,100 and 10 percent more than $25,900.

Statistical clerks' salaries vary by industry. They tend to be highest in public utilities and mining and lowest in finance, insurance, and real estate.

Experienced statistical clerks in the private sector earned average salaries of $16,172 a year in 1984, according to a survey by the Executive Compensation Service.

The entrance salary for beginning statistical assistants employed by the Federal Government was $12,862 a year in 1985. The average annual salary for statistical assistants in the Federal Government was $16,243 in 1984.

Related Occupations

Other workers perform calculations, keep numerical records, and prepare statistical reports for use by other departments in a company. Among these are accounting clerks, bookkeepers, payroll clerks, personnel clerks, and insurance clerks.

Sources of Additional Information

State employment service offices can provide information about job openings for statistical clerks.

Stenographers

(D.O.T. 202.362 and 203.582-058)

Nature of the Work

The efficient conduct of business and other endeavors often requires a precise written record of spoken information and communication. Stenographers provide such records.

Stenographers (D.O.T. 202.362-014) and *stenotype operators* (D.O.T. 202.362-022) take dictation and then transcribe their notes on a typewriter or word processor. They may either take shorthand or use a stenotype machine, which prints shorthand symbols. *General stenographers*, including most beginners, take routine dictation and do other office tasks such as typing, filing, answering telephones, and operating office machines. Experienced and highly skilled stenographers take difficult dictation and do more responsible clerical work. They may sit in on staff meetings and later give a summary report or a word-for-word record of the proceedings. They also supervise other stenographers, typists, and clerical workers. *Technical stenographers* must know the terms used in a particular profession. They include medical, legal, and engineering or scientific stenographers. Some experienced stenographers take dictation in foreign languages; others work as public stenographers serving traveling business people and others.

Shorthand reporters (D.O.T. 202.362-010) are specialized stenographers who record all statements made in an official proceeding. Shorthand reporters often work as *court reporters*. They take down all statements made at legal proceedings and present their record as the official transcript. Many other shorthand reporters work as *freelance reporters* who record out-of-court testimony for attorneys, proceedings of meetings and conventions, and other private activities. Still others record the proceedings in the U.S. Congress, in State legislatures, and in State and Federal agencies. Some reporters dictate notes on magnetic tapes that a typist can transcribe later. Other reporters transcribe their notes with the help of note readers, persons skilled in reading back shorthand notes. A large and growing number of reporters use Computer-Aided Transcription, a system in which a computer directly translates the reporter's shorthand notes into English. Because the reporter's transcript is the official record of a proceeding, accuracy is vitally important.

Transcribing-machine operators (D.O.T. 203.582-058) listen to recordings and use a typewriter or word processor to transcribe what they hear in the proper format. In addition to transcribing letters, reports, and the like, they may have some other clerical duties. Sometimes they are called dictating-machine transcribers or dictating-machine typists.

Print shop stenographers (D.O.T. 202.362-018) take dictation and use typewriters to transcribe the dictated material and to prepare metal printing

Stenographers must record every word of dictation.

plates to be used by addressing machines.

Working Conditions

Stenographers usually work in clean, well-lighted offices. Sometimes they work in nonoffice settings, such as courts, legislatures, and conventions.

Stenographers generally work a standard 40-hour week. In some cities, especially in the Northeast, the scheduled workweek is 37 hours or less.

Employment

Stenographers held about 239,000 jobs throughout the economy in 1984. Over a quarter worked for government agencies, a reflection of the large number of shorthand reporters working in courts, legislatures, and agencies in the executive branch.

Training, Other Qualifications, and Advancement

Employers usually have no preferences among the many different shorthand methods. For court reporters, however, the preference is for stenotype, not only because reporters can write faster using stenotype, but also because they can feed stenotype notes to a computer for high-speed transcription. The most important factors in hiring and promotion are speed and accuracy. To qualify for jobs in the Federal Government, steonographers must be able to take dictation at a minimum of 80 words per minute and type at least 40 words per minute. Workers must achieve higher rates to advance to more responsible positions. In private firms, the requirements vary, but applicants with the best speed and accuracy will receive first consideration in hiring. Many shorthand reporting jobs require more than 225 words of dictation per minute; shorthand reporters in the Federal Government generally must take at least 175 words a minute. Some States require each court reporter to be a Certified Shorthand Reporter (CSR). A certification test is administered by a board of examiners in each State that has CSR laws. The National Shorthand Reporters Association confers the designation Registered Professional Reporter (RPR) upon those who pass a two-part examination and participate in continuing education programs. The RPR designation is recognized as the mark of excellence in the profession.

Stenographers can advance to secretarial positions. Stenographers who acquire the necessary speed through additional training can become shorthand reporters.

Job Outlook

Employment of stenographers is expected to decline sharply. The widespread use of dictation machines has greatly reduced the need for office stenographers, and the traditional "steno pool" is becoming a thing of the past. However, demand for skilled shorthand reporters should remain strong as State and Federal court systems expand to handle the rising number of criminal court cases and civil lawsuits. Competition for entry level jobs as shorthand reporters is increasing as more students enter the field. Opportunities will be best for those who have earned certification by the National Shorthand Reporters Association.

Earnings

Stenographers' salaries vary a great deal, usually reflecting differences in skill, experience, level of responsibility, and industry.

Stenographers in private industry averaged $17,241 a year in 1984; experienced stenographers averaged $20,376. Clerk-stenographers employed by the Federal Government in 1984 had average annual salaries of about $14,200.

Legal stenographers in the private sector earned an average annual salary of $17,056 in 1985, according to a survey by the Executive Compensation Service.

Shorthand reporters generally earn higher salaries than stenographic officeworkers. Earnings vary, depending on speed, education, experience, and geographic location (earnings are generally higher in large cities than in rural areas).

Stenographers' salaries tend to be highest in public utilities and manufacturing and lowest in finance, insurance, and real estate.

Employers usually pay stenographers who have word processing experience higher salaries than those without such experience.

Most stenographers in large cities receive 7 paid holidays or more a year and a 2-week vacation after working 1 year. With added years of service, vacations may range to 4 weeks or more. Group life and health insurance, pension plans, and other fringe benefits often are provided.

Related Occupations

A number of other workers type, record information, and process paperwork. Among these are bookkeepers, receptionists, secretaries, office managers, personnel clerks, typists, administrative assistants, medical assistants, and legal assistants.

Sources of Additional Information

For information about shorthand reporting, contact:

National Shorthand Reporters Association, 118 Park St. SE., Vienna, Va. 22180.

Brochures describing a career as a shorthand reporter or court reporter are available upon request from:

Association of Independent Colleges and Schools, 1 Dupont Circle, NW., Suite 350, Washington, D.C. 20036.

State employment offices can provide information about job openings for stenographers locally and nationwide.

Teacher Aides

(D.O.T. 099.327-010, 219.467-010 and 249.367-074,-086)

Nature of the Work

Teacher aides handle routine activities to give teachers more time for teaching. They help and supervise students in the classroom, cafeteria, or school yard. They record grades, set up equipment, or help prepare materials for instruction.

Aides' responsibilities vary greatly by school district. In some, aides help with the instruction of children, under the supervision and guidance of teachers. They work with students individually or in small groups—listen to students read, help them find information for reports, and watch them demonstrate a skill. Sometimes, aides take charge of special projects and prepare equipment or exhibits for a science demonstration, for example.

In other districts, teacher aides handle routine nonteaching tasks. They grade tests and papers, check homework, and keep health and attendance records. Secretarial duties such as typing, filing, and duplicating materials for the teacher's use may be part of the aide's job. At other times they may stock supplies, operate audiovisual equipment, and keep classroom equipment in order. They also may supervise students during lunch and recreation periods and school bus loading.

Working Conditions

Many teacher aides work part time. They may work outdoors when weather allows and spend much of their time standing, walking, or kneeling. Working closely with the students can be both physically and emotionally tiring.

Employment

Teacher aides held 479,000 jobs in 1984. Although they are employed in both elementary and secondary schools, aides are concentrated in the lower grades. Some assist special education teachers with physically, mentally, or emotionally handicapped children. Their employment is distributed geographically much the same as the population.

Training, Other Qualifications, and Advancement

Educational requirements for teacher aides range from less than a high school diploma to some college training. Districts that give aides teaching responsibilities usually require more training than those which assign them clerical or monitor duties.

Teacher aides generally receive on-the-job training. However, a number of 2-year and community colleges offer associate degree programs that prepare graduates to work as teacher aides.

Newly hired teacher aides undergo a period of orientation and training. Aides are taught how to operate audiovisual equipment, administer first aid, and keep records. They learn to make charts and other instructional materials and how to prepare bulletin boards. In addition, they are made familiar with the organization and operation of a school and the methods used to teach handwriting, reading, math, science, and other subjects.

Teacher aides should enjoy working with children and be able to handle classroom situations with fairness and patience. Preference may be given in hiring to those with previous experience in working with children. Aides also must demonstrate initiative and a willingness to follow teacher's directions. They must have good oral and writing skills and be able to communicate effectively with students and teachers. Clerical skills may also be necessary.

Ten States have certification procedures for general teacher aides. To qualify, an individual may need a high school diploma or general equivalency degree (G.E.D.), or even some college training. Kansas, Louisiana, Texas, and Wisconsin grant permits for paraprofessionals, as some aides are called, in the field of special education.

Many schools may have additional regulations regarding the hiring of teacher aides. For example, some school districts give preference to persons residing within the school district; some require that teacher aides pass a physical examination.

School superintendents and State departments of education can provide details on employment requirements.

Advancement for teacher aides, usually in the form of higher earnings or increased responsibility, comes primarily with experience. Some school districts provide release time so that aides may take college courses. Aides who earn bachelor's degrees may become certified teachers.

Job Outlook

Employment of teacher aides is expected to increase about as fast as the average for all occupations through the mid-1990's, primarily reflecting rising enrollments at the elementary school level. Enrollment growth will not occur at the same rate in all parts of the country, however. Largely because of migration to the South and West, enrollment increases are expected to be greater in those regions than in the Northeast and North Central States.

Teacher aide employment is sensitive to changes in State and local expenditures for education. Pressures on education budgets are greater in some States and localities than in others. A number of teacher aide posi-

Under the teacher's supervision, aides sometimes help with the instruction of children.

tions are financed through Federal programs, reductions in which would affect some districts more than others.

Because of relatively high turnover in the occupation, most openings for teacher aides are expected to occur as a result of the need to replace workers who transfer to other occupations, leave the labor force to assume full-time housekeeping responsibilities, return to school, or for other reasons.

Earnings

In 1984-85, teacher aides involved in teaching activities earned an average of about $6 an hour; those performing only nonteaching activities averaged about $5.50 an hour. Earnings varied by region and also by the work experience and academic qualifications of the aide. Many aides are covered by collective bargaining agreements and have health and pension benefits similar to those of the teachers in their schools.

Related Occupations

The educational support activities that teacher aides perform demand organizational skills, cooperativeness, recordkeeping ability, and a talent for getting along with people. Other occupations requiring some or all of these skills include childcare attendants, career guidance technicians, home health aides, library attendants, medical record technicians, nurse aides, receptionists, record custodians, and retail sales clerks.

Sources of Additional Information

Information on a wide range of education-related issues, including teacher aide unionization, can be obtained from:

American Federation of Teachers, 555 New Jersey Ave. NW., Washington, D.C. 20001.

Telephone Operators

(D.O.T. 235.222, .462, .562-014, .662-014, -018, -022, and -026; and 239.367-026)

Nature of the Work

Although millions of telephone numbers are dialed directly each day, making a call sometimes requires the assistance of a telephone operator. An operator may be needed because a caller wants to reverse long-distance charges, find out a telephone number in another city, or know the cost of a call. Operators also help contact the police or fire department in an emergency and arrange conference calls for business executives.

Two groups of telephone operators provide these services. The operators who work in telephone company central offices probably are the most familiar. But many businesses and large organizations receive so many calls that they employ operators to run their private branch exchange (PBX) switchboards. Often these workers act as receptionists as well as PBX operators. (Receptionsts are described elsewhere in this section of the *Handbook*). Sometimes operators place calls by inserting and removing plugs in switchboards and by listening and speaking into their headsets. However, many switchboards, especially those in telephone company central offices, are operated by pushbuttons.

Telephone company operators known as central office operators help customers with calls that require assistance, such as person-to-person, coin-station, and collect calls. They obtain the information needed to complete the call and record the details for billing. Those who make long-distance connections are called long-distance operators. Directory assistance operators answer customer inquiries for telephone numbers by using computerized alphabetical and geographical directories. Sometimes the directory assistance operator does not even need to read the number—instead, a computerized recording provides the answer.

Switchboard operators, sometimes called PBX attendants or operators, run switchboards for business firms and other establishments. They connect interoffice or house calls, answer and relay outside calls, assist company employees in making outgoing calls, supply information to callers, and record charges. Modern PBX switchboards permit direct inward dialing. This allows calls to be made to and from the office without going through the switchboard. In such establishments, PBX operators may do other office work as well such as typing or sorting mail. Many act as receptionists or information clerks.

Qualified telephone company operators can become private-branch-exchange service advisors, sometimes called customer instructors or telephone usage counselors. They conduct training classes in the operation of switchboard and teletype equipment at the company's training school or on the customer's premises. Qualified operators also can become service observers. Service observers monitor telephone conversations between operators and customers to observe the operator's behavior, technical accuracy, and adherence to company policies.

Police district switchboard operators run switchboards to receive and transmit police communications, such as calls from citizens for assistance or from police officers in the field. Communication-center operators handle airport authority communication systems and monitor electronic equipment alarms. For example, they use the public address system to page passengers or visitors. Telephone-answering-service operators manage switchboards to provide answering service for clients.

Working Conditions

Telephone company operators generally work 37 to 40 hours a week. The scheduled hours of PBX operators generally are the same as those of other clerical workers in the firm. In telephone companies, however, and in hotels, hospitals, and other places where telephone service is needed on a 24-hour basis, operators work shifts, even on holidays and weekends. Some operators work split shifts—that is, they are on duty during the peak calling periods in the late morning and early evening and have time off in between. Telephone companies normally assign shifts by seniority, allowing the most experienced workers to choose when they will work. These operators, like all telephone company employees, are subject to 24-hour call. In general, though, they work overtime only during emergencies. Because an operator cannot make up time missed, telephone companies strictly regulate attendance and punctuality.

Operators usually work in pleasant, well-lighted, air-conditioned surroundings. The job of a telephone operator requires little physical exertion; however, during peak calling periods, the pace at the switchboard may be hectic. Often operators are unable to leave their work stations during these periods. Telephone companies continually strive to increase operator efficiency, and this can create a tense work environment. An operator's work generally is quite repetitive and, in telephone companies, is closely supervised.

Employment

Telephone operators held about 456,000 jobs in 1984. More than one-half worked as PBX operators in manufacturing plants, hospitals, department stores, or businesses. The remainder worked in telephone companies. Roughly one-third of all operators work part time, although relatively few of those employed by telephone companies do so.

Employment is concentrated in heavily populated areas; large numbers of telephone operators work in the New York City, Chicago, and Los Angeles metropolitan areas. An increasing number work in rapidly growing areas such as Houston and Denver.

Training, Other Qualifications, and Advancement

Persons interested in becoming telephone operators should like to serve the public, be pleasant, courteous, and patient, and not mind sitting for long periods of time. A clear, pleasing voice and good hearing are important. In addition to being good listeners, prospective operators should have good reading, spelling, and arithmetic ability. Good eye-hand coordination and manual dexterity are useful, as is an ability to work well under pressure. Many telephone companies and business firms require applicants, including operators, to pass a physical examination. Some employers require a high school diploma for operator jobs. High school courses in speech, office practices, and business math provide a helpful background for persons interested in this occupation.

New operators are taught how to use the equipment and keep records of calls. Once they have learned the procedure, they put through practice calls. In the telephone companies, classroom instruction usually lasts up to 3 weeks and is followed by on-the-job training. Classroom instruction covers the time zones and geography so that central office operators understand rates and know where major cities are located. Tapes are used to familiarize trainees with the dial tone, busy signal, and other telephone sounds and to improve diction and courtesy by giving them an opportunity to hear their own voices. Training is tailored to the knowledge required of the department where the employee is going to work. Close supervision continues after training is completed.

Telephone company operators use computerized directories to answer customer inquiries.

PBX operators who handle routine calls usually have a somewhat shorter training period than telephone company operators. These workers usually are trained informally by experienced personnel, although in large businesses an instructor from the local telephone company may train new employees.

Telephone company operators may be promoted, after 1 or 2 years of experience, to junior service assistant or service observer, assisting the supervisor by monitoring telephone conversations. Promotion to supervisor also is possible. Some operators advance to other clerical jobs or to telephone craft jobs such as installer and repairer. Large firms may advance PBX operators to more responsible clerical positions; however, many small businesses have limited advancement opportunities.

Job Outlook

Overall employment of telephone operators is expected to grow as fast as the average for all occupations through the mid-1990's. Many job opportunities for switchboard operators are expected to occur each year as businesses expand to meet the changing needs of the population. Employment of directory assistance operators and central office operators is expected to decline. Most job openings for telephone operators will result from the need to replace experienced employees who stop working or transfer to other occupations.

Employment of switchboard or PBX operators is expected to grow faster than the average as businesses expand. Prospects will be especially good for switchboard operator/receptionists— receptionists who have been trained to make telephone connections. Many PBX systems have a direct-inside-dialing (DID) option which relieves these operators of the need to handle every call. This frees them to concentrate on other clerical tasks. It is this flexibility that appeals to employers and will greatly stimulate demand for these workers.

Employment prospects for telephone company operators will be poor. Employment of these workers has been declining for the past 25 years as technological innovations have reduced labor requirements. Productivity improvements that reduce the need for operators are expected to continue, and they will more than offset the employment gains from strong growth in residential and business demand for telephone services and the development of new markets, including electronic funds transfer systems and home data processing. As a result, employment of telephone company operators is expected to decline into the mid-1990's.

Technological innovations have taken place in a number of areas. Many telephone companies have installed electronic switching systems in their central offices, thus reducing the need for manual switching. Traffic service position systems have been added; these automatically feed data about each telephone connection, such as the length and cost of the call, into a computer that processes the billing statements. Formerly, an operator tabulated and then transferred this information to the statement. It is now possible in many places to dial numbers in other countries directly, without the help of an operator. The task of responding to "intercept" calls (vacant, changed, or disconnected numbers) is being automated. A device automatically answers those calls and a computerized recording explains the reason for the interception and gives new number information. The monitoring and computing of charges on calls from pay telephones also are being automated, eliminating functions normally performed by operators. Also, calls made with telephone company credit cards will no longer require the assistance of an operator. Directory assistance operators now can find numbers more quickly because they use a computerized system that shows the information on a screen, whereas before they had to leaf through paper directories. In addition, computerized recordings are starting to be used to give the number to the caller once it has been found by the operator. Another change, while not of a technological nature, is expected to reduce the demand for directory assistance operators. A number of telephone companies now charge customers for directory assistance calls, thus prompting customers to use telephone directories instead.

Employment of operators is less sensitive to fluctuations in the business cycle than employment of other workers in the telephone industry. The volume of telephone calls is affected very little by economic fluctuations. However, telephone companies hire fewer operators during recessions because there is less turnover (and consequently fewer openings) when other jobs are relatively hard to find. Few PBX operators are laid off during recessions because, even in slow times, businesses must keep their lines of communication open.

Technological change has had a far greater effect than the business cycle on employment of telephone company operators. However, operators are seldom laid off, for collective bargaining agreements ensure that the companies reduce employment either through attrition or by retraining or reassignment.

Earnings

Telephone operators earned median weekly salaries of $290 in 1984. The middle 50 percent earned between $225 and $375. The bottom 10 percent earned less than $170; the top 10 percent earned more than $450 a week. Telephone company operators generally earn more than switchboard operators.

Earnings of experienced telephone operators are about the same as the average for all nonsupervisory workers in private industry, except farming. A 1984 survey by the International Personnel Management Association of workers at all levels of government showed that telephone operators earned between $11,290 and $14,480. In 1985, the Federal Government paid starting telephone operators $10,500 per year. The average annual salary in 1984 for all operators employed by the Federal Government was $13,560.

PBX operators nationwide averaged $12,500 a year in 1984 according to a survey by the Administrative Management Society.

Most telephone company operators are members of the Communications Workers of America, the International Brotherhood of Electrical Workers, or the Telecommunications International Union. For these operators, union contracts govern wage rates, wage increases, and the time required to advance from one step to the next (it normally takes 4 years to rise from the lowest paying, nonsupervisory operator position to the highest). Contracts also call for extra pay for work beyond the normal 7 1/2 hours a day or 5 days a week, and for all Sunday and holiday work. Most contracts provide a pay differential for nightwork and split shifts. Paid vacations are granted according to length of service. Many contracts provide for a 1-week vacation beginning with 6 months of service; 2 weeks for 1 to 6 years; 3 weeks for 7 to 14 years; 4 weeks for 15 to 24 years; and 5 weeks for 25 years and over. Depending on locality, holidays range from 9 to 11 days a year. Additional provisions may include paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

Insurance, pensions, holidays, vacations, and other benefits for PBX operators are the same as those for other clerical employees in the firm.

Related Occupations

Other workers who provide information to the general public include customer service representatives, dispatchers, hotel clerks, information clerks, police aides, receptionists, reservation agents, taxicab starters, and travel clerks.

Sources of Additional Information

For more details about employment opportunities, contact your local telephone company or the following unions that represent telephone workers:

Communications Workers of America, 1925 K St. NW., Washington, D.C. 20006.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Telecommunications International Union, P.O. Box 5132, Hamden, Conn. 06518.

For general information on the telephone industry and career opportunities in it, request copies of *Independent Phonefacts* and *Is It for You? A Career in the Independent Telephone Industry* from:

United States Telephone Association, 1801 K St.NW., Suite 1201, Washington, D.C. 20006.

Traffic, Shipping, and Receiving Clerks

(D.O.T. 209.367-042; 214.587-014; 219.367-022 and -030; 221.367-022 and .687-014; 222.367-066, .387-014, -022, -050, and -054, .485-010, .567-010 and -014, .587-010, -018, -034, and -058, .687-022 and -030; 248.362-010, .367-014 and -022; 919.687-010; and 976.687-018)

Nature of the Work

Traffic, shipping, and receiving clerks keep track of goods transferred between businesses and their customers and suppliers. In small companies, one clerk may record all shipments sent out and received; in larger companies, a number of clerks take care of this recordkeeping.

Traffic clerks record data about incoming and outgoing freight, such as their destination, weight, and charges. To be sure the rate charges are accurate, they compare the classification of materials with rate charts. They may keep a file of claims for overcharges and for damages to goods in transit.

Shipping clerks are responsible for all shipments leaving a place of business. Before goods are sent to a customer, these clerks make sure the order has been filled correctly, or may fill the order themselves. They obtain merchandise from the stockroom and wrap it or pack it in shipping containers. Clerks also put addresses and other identifying information on packages, look up and compute either freight or postal rates, and record the weight and cost of each shipment. They also may prepare invoices and furnish information about shipments to another part of the company, such as the accounting department. Once a shipment is checked and ready to go, shipping clerks may move it—sometimes by forklift truck—to the shipping dock and direct its loading into trucks according to its destination. Shipping and receiving clerks in small businesses may perform some stock clerk duties.

When shipments arrive, receiving clerks perform tasks similar to those of shipping clerks. They determine whether their employer's orders have been correctly filled by verifying incoming shipments against the original order and the accompanying bill of lading or invoice. They record the shipment and the condition of its contents. As more and more industries move toward automating their shipping and receiving operations, receiving clerks increasingly are recording much of the necessary data by using hand-held scanners and readers to read the bar codes on incoming products. After recording this information, they connect the scanner or reader to a personal computer and transfer the data to be processed. Clerks also arrange for adjustments with shippers whenever merchandise is lost or damaged. The job may also include routing or moving shipments to the proper department, warehouse section, or stockroom and providing information that is the basis of a computerized inventory system.

Counting the merchandise in shipments is a key part of the job.

Working Conditions

Although shipping and receiving clerks generally work in warehouses or in shipping and receiving rooms, they may spend considerable time on outside loading platforms. Workplaces often are large, unpartitioned areas that may be drafty, cold, and littered with packing materials.

Most clerks have to stand for long periods while they check merchandise. Locating numbers and descriptions on cartons often requires a great deal of bending, stooping, stretching, and lifting. Also, under the pressure of getting shipments moved on time, clerks sometimes may help load or unload materials in the warehouse.

Night work and overtime, including work on Saturdays, Sundays, and holidays, may be necessary when shipments have been unduly delayed or when materials are needed immediately on production lines. Shipping and receiving clerks receive time and one-half for work over 40 hours.

Employment

Traffic, shipping, and receiving clerks held about 651,000 jobs in 1984. About half were employed by wholesale establishments or retail stores and over one-third worked in factories. Although jobs for traffic, shipping, and receiving clerks are found throughout the country, most clerks work in urban areas, where factories and wholesale establishments generally are located.

Training, Other Qualifications, and Advancement

High school graduation is usually required for beginning jobs in shipping and receiving departments. Business arithmetic, typing, and other high school business subjects are helpful. The ability to write legibly and keep orderly records is important. In general, jobseekers must demonstrate that they can master company procedures, including the use of automated equipment. With the rapidly growing use of computers for inventory control and other recordkeeping purposes, the jobs of traffic, shipping, and receiving clerks are increasingly machine oriented.

Willingness to work at repetitive tasks, dependability, and an interest in learning about the firm's products and business activities are other qualities that employers seek.

New employees usually are trained on the job by an experienced worker. As part of their training, they often file, check addresses, attach labels, and check items included in shipments. As clerks gain experience, they may be assigned tasks requiring a good deal of independent judgment, such as handling problems with damaged merchandise, or supervising other workers in shipping or receiving rooms.

A job as a traffic, shipping, or receiving clerk offers a good opportunity for new workers in a firm to learn about their company's products and business practices. Some clerks may be promoted to head traffic, shipping, or receiving clerk; warehouse manager; or purchasing agent. (Purchasing agents are discussed elsewhere in the *Handbook.*) Very experienced workers with a broad understanding of shipping and receiving may enter related fields such as industrial traffic management.

Job Outlook

Employment of traffic, shipping, and receiving clerks is expected to increase more slowly than the average for all occupations through the mid-1990's, in part because so many clerks work in manufacturing and wholesale trade, industry sectors that are expected to grow more slowly than the overall economy.

Employment growth will continue to be affected by automation, as all but the smallest firms move to hold down labor costs by using computers to store and retrieve shipping and receiving records. Methods of materials handling have changed significantly in recent years. Large warehouses are increasingly automated, using equipment such as computerized conveyor systems, robots, computer-directed trucks, and automatic storage and retrieval systems. This automation, coupled with the growing use of hand-held scanners and personal computers in receiving departments, is expected to hold down employment growth.

Nevertheless, numerous job openings will occur every year as traffic, shipping, and receiving clerks transfer to other jobs or leave the labor force. Because this is an entry level occupation, many vacancies are created by normal career progression.

While the amount of movement in and out of the occupation is about average for a clerical occupation, the reasons for that movement are atypical. Unlike office clerical workers, who tend to be women, the majority of shipping and receiving clerks are men. Thus, few clerks leave their jobs because of homemaking responsibilities, for example. Openings for shipping and receiving clerks generally occur because workers have taken other jobs.

Earnings

Median weekly earnings of full-time traffic, shipping, and receiving clerks were about $280 in 1984; the middle 50 percent earned between $220 and $380 a week. Ten percent earned less than $170 and 10 percent more than $500.

Shipping and receiving clerks in urban areas earned average weekly salaries of $321 in 1984. This was about as much as the average for all nonsupervisory workers in private industry, except farming. Salaries varied substantially, however, by type of employer. Shipping and receiving clerks employed in the services industry averaged $292, those working for wholesale houses averaged $324, and those employed by public utilities averaged $354. In addition, shipping and receiving clerks working in the Midwest tended to have the highest salaries, while those in the South had the lowest.

Shipping and receiving clerks employed in the private sector averaged $280 a week in 1985, according to an Administrative Management Society survey.

Related Occupations

Traffic, shipping, and receiving clerks record, check, and often store the materials that a company receives. They also process and pack goods for shipment. Other workers who perform similar duties are stock clerks, material clerks, distributing clerks, routing clerks, and order fillers.

Sources of Additional Information

State employment service offices can provide information about job openings for traffic, shipping, and receiving clerks.

Typists

(D.O.T. 203.362-010 and -022, .382-010, .582-034, -066, and -078, and 209.382-010)

Nature of the Work

A rapid flow of communication is essential to the modern office. The typist helps to maintain this flow by making neat, typed copies of handwritten, printed, and recorded words.

Beginning or *junior typists* usually type headings on form letters, copy directly from handwritten drafts, and address envelopes. Often, they perform other office tasks as well: Answering telephones, filing, and operating copiers, calculators, and other officemachines.

More experienced typists do work that requires a high degree of accuracy and independent judgment. *Senior typists* work from rough drafts which are difficult to read or which contain technical material. They may plan and type complicated statistical tables, combine and rearrange materials from different sources, or prepare master copies to be reproduced on copying machines.

Clerk typists (D.O.T. 203.362-010) combine typing with filing, sorting mail, answering telephones, and other general office work. *Bordereau clerks* (D.O.T. 203.382-010) compile data and type applications for insurance companies. *Notereaders* (D.O.T. 203.582-078) transcribe stenotyped notes of court proceedings into standard formats. *Continuity clerks* (D.O.T. 209.382-010) aid movie editors by typing descriptive records of motion picture scenes, including such things as dialog, wardrobe, hairdress, and on-scene entrances and exits of actors.

Increasingly, word processing centers handle the transcription and typing for several departments within an organization. *Word-processing-machine operators* (D.O.T. 203.362-022) use word processing equipment to record, edit, store, and revise correspondence, reports, statistical tables, forms, and other materials. Word processing equipment normally includes a keyboard, a cathode ray tube (CRT) display, and a printer, and may have "add-on" capabilities such as optical character recognition (OCR) readers. Many word-processing-machine operators work in large, centralized word processing centers that are relatively isolated from other departments. Others, however, are located in smaller, more decentralized settings that are physically dispersed throughout the organization and they work fairly closely with employees from other departments.

Working Conditions

Typists usually work in offices that are clean. They sit for long periods and sometimes must contend with high noise levels caused by various office machines, such as printers, or with lighting that may be inappropriate if they are using video display terminals (VDT's, also referred to as CRT's). Depending on the organization of the office and its equipment and furniture, these workers may experience problems such as eyestrain and musculoskeletal strain and pain.

Increasingly, research on occupational health and safety is focusing on the hazards to physical and mental health posed by new generations of office equipment. Studies have found that typists who work full time on VDT's experience stress, and growing attention is being paid to the risk of eye problems, miscarriage, and birth defects that may be experienced by women who use certain kinds of equipment.

Typists generally work a standard 40-hour week. In some cities, especially in the Northeast, the scheduled workweek is 37 hours or less.

Office work lends itself to alternative or flexible working arrangements; many typists hold temporary jobs and one in four works part time. Some of these part-time workers are self-employed freelance typists; others take short-term jobs through temporary help agencies. A few employers are experimenting with "home based" offices; sophisticated computerized equipment installed in typists' homes enables them to transcribe material at home and, almost instantly, produce printed copy in an office miles away. However, these jobs often do not include the full range of fringe benefits and they lack the advantages of social interaction on the job.

Employment

Typists held about 991,000 jobs in 1984. They work in every sector of the economy. Approximately one-third worked for business firms—chiefly those in manufacturing; wholesale and retail trade; transportation, communications, and public utilities; and finance, insurance, and real estate. About one-third held jobs in educational institutions, hospitals, membership organizations, and firms that provide business services. Among the latter are temporary help agencies and word processing service bureaus. About one-quarter worked in Federal, State, and local government agencies.

Some typists work for temporary help agencies.

Training, Other Qualifications, and Advancement

Employers generally hire high school graduates who can meet their requirements for typing speed. Increasingly, employers expect applicants to have word processing training or experience. Good spelling, punctuation, and grammar are important skills, and familiarity with standard office equipment and procedures is an asset. Because they often work for many people at one time, good interpersonal skills are helpful.

Typing can be learned in different ways. Typing is taught in high schools, community colleges, business schools, and home study schools. Some individuals learn on their own, using self-teaching aids like books, records, and personal computers. Some people learn to type for personal convenience, or because it is a useful skill for other jobs. Word processing is taught in many community colleges and business schools and is beginning to be taught in high schools.

Large companies and government agencies generally have training programs to help clerical employees upgrade their skills and advance to more responsible positions, including that of typist. Nonetheless, the proportion of job openings filled by workers who transfer from other occupations is lower than average. People who become typists tend to come from outside the labor force; they are younger than average, and many probably have never worked before. The proportion who transfer to other occupations is higher than average, suggesting that typing serves as a steppingstone to higher paying, more responsible jobs. It is common for typists to transfer to another clerical job, such as secretary, statistical clerk, or stenographer, or to be promoted to a supervisory job in a word processing center.

Job Outlook

Employment of typists is expected to experience little or no change through the mid-1990's despite the "information explosion" and rapid growth in the volume of business transactions. This is an indication of significant productivity improvements in the clerical sector due to widespread use of word processing equipment.

Jobs will be available, however, because of replacement needs. In typing, as in most occupations, replacements are the main source of jobs. Every year, a substantial number of typists transfer to other kinds of jobs or leave the labor force temporarily—chiefly because of household responsibilities or to attend school. Compared to those who leave for other reasons, relatively few typists stop working because of disability or retirement.

With the installation of word processing equipment, the productivity of typists has risen dramatically, for such equipment allows work to be undertaken of a degree of complexity and in amounts that would have been unthinkable in the past. Improvements in optical character recognition technology (whereby a machine reads and types documents) are occurring, and widespread commercial application before the mid-1990's is possible. This would appreciably reduce the typing workload. In addition, as more and more professionals and managers use desktop personal computers and executive workstations, they will handle some of the work previously delegated to support staff.

Nevertheless, the volume of office work to be processed is expected to grow so rapidly that employment of typists is not expected to decline in the decade ahead. A sharp drop in typist jobs is likely when voice data entry systems are perfected and become commercially viable, but this probably will not happen before the late 1990's.

Job prospects should be brightest for those typists with the best technical skills. In particular, the more word processing languages typists know, especially the more complex ones, the better their job opportunities will be.

Earnings

Beginning typists averaged $11,793 a year in 1984; those with experience averaged $15,150. Median annual earnings of full-time typists were about $13,000 in 1984; the middle 50 percent earned between $10,900 and $16,500 annually. Ten percent earned less than $8,900 and 10 percent more than $20,700.

According to a survey by the Administrative Management Society, word processing operators in the private sector earned average annual salaries ranging from $14,092 to $17,420 in 1985, depending on the complexity of the work and the level of responsibility.

Average yearly earnings for clerk-typists in the Federal Government were about $12,400 in 1984.

Typists' salaries vary by industry. They tend to be highest in public utilities and manufacturing and lowest in finance, insurance, and real estate.

Typists generally receive higher salaries if they have word processing experience.

Most typists in large cities receive 7 paid holidays or more a year and a 2-week vacation after working 1 year. With added years of service, vacations may range to 4 weeks or more. Group life and health insurance, pension plans, and other fringe benefits often are provided.

Related Occupations

Many other office workers use typing skills. Among these are secretaries, stenographers, receptionists, office machine operators, personnel clerks, and administrative assistants.

Sources of Additional Information

State employment offices can provide information about job openings for typists locally and nationwide.

best copy available

Service Occupations

Guarding and cleaning buildings, preparing and serving food, helping physicians examine patients, cutting and styling hair, and caring for children and elderly persons all are jobs performed by service workers. In 1984, service workers held about 16.6 million jobs. The major groups of service occupations are discussed below:

Protective service workers, who held over 1.9 million jobs in 1984, are employed to safeguard lives and property. Police and detectives, guards, and workers in firefighting occupations accounted for four-fifths of all protective service jobs. Others included sheriffs, bailiffs, crossing guards, correction officers, fish and game wardens, private detectives and investigators, and parking enforcement officers. Most protective service workers are government employees, working primarily at the local level. Protective service work is generally routine, but sometimes it can be dangerous.

Cleaning and building service workers held about 3 million jobs in 1984; they clean and maintain buildings such as apartments, houses, schools, and offices. The group includes janitors, elevator operators, maids, and pest controllers.

Food and beverage preparation and service workers—the largest group of service workers—held about 6.6 million jobs in 1984. They prepare and serve food in restaurants, cafeterias, schools, hospitals, and other institutions. Workers in this group include cooks, waiters and waitresses, bakers, bartenders, dining room and cafeteria attendants, food preparation workers, and hosts and hostesses.

Health service workers, who held nearly 1.7 million jobs in 1984, include medical, dental, occupational therapy, pharmacy, and physical therapy assistants as well as ambulance drivers and nursing and psychiatric aides. These workers are employed in hospitals, nursing homes, rehabilitation centers, and doctors' and dentists' offices. They typically perform routine but essential tasks that involve a great deal of personal contact.

Personal service workers, who held about 1.6 million jobs in 1984, range from barbers and cosmetologists to sightseeing guides and flight attendants. The ability to deal with all kinds of people is a "must" in these jobs.

Private household service workers, who held almost 1 million jobs in 1984, are domestic workers who clean their employers' homes, prepare meals, and care for children. Others include launderers and housekeepers.

Training, Other Qualifications, and Advancement

Training and skill requirements differ greatly among the various service occupations. FBI special agents, for example, must have a college degree. Barbers and cosmetologists need specialized vocational training and a license. Still other occupations—household workers, janitors, and hotel bellhops, for example—have no specific educational requirements for entry, although a high school diploma is always an advantage.

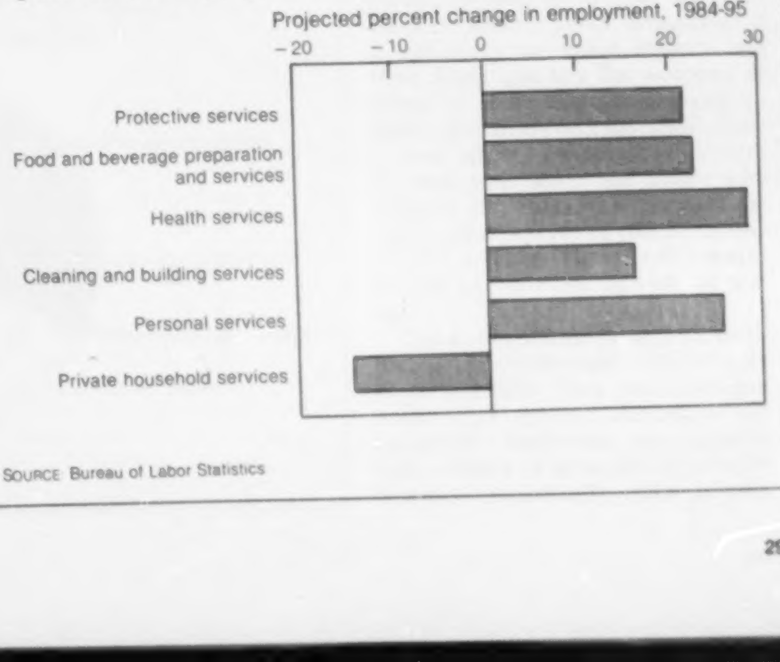
For many service occupations, personality traits and special abilities may be as important as formal schooling. Thus, physical strength and endurance are necessary for work as a porter, lifeguard, or firefighter; and a pleasing manner and appearance are especially important for a flight attendant or a waiter or waitress. Other service workers, such as police officers and travel guides, need good judgment and should be skillful in dealing with people.

Some service workers eventually go into business for themselves as caterers or restaurant operators, for example, or proprietors of barber or beauty shops. A good basic education and extensive experience in their chosen fields are decided assets for prospective business owners.

Job Outlook

More job openings are expected to be available for service workers than for almost any other major occupational group. The overwhelming majority of openings will result from replacement needs, as a relatively high proportion of service workers transfer to other occupations, assume full-time household responsibilities, return to school, or stop working for other reasons each year. Job turnover is particularly high among food and beverage prepa-

Among service occupations, those in health services are expected to grow the most rapidly.



SOURCE: Bureau of Labor Statistics

ration and service workers and private household workers.

The service occupations are expected to grow about as fast as the average for all occupations through the mid-1990's. However, employment growth in the major groups of service occupations is expected to vary, as shown in the accompanying chart. Demand for health service workers will be particularly strong as a result of population growth, an aging population, and continued emphasis on using auxiliary health personnel. More protective service workers will be needed as the population increases and the need grows for protection against crime, theft, and vandalism. Rising incomes, increasing leisure time, and the growing number of men and women who combine family responsibilities and a job are likely to cause the demand for food and beverage preparation and service workers to grow as more people dine out. Despite a strong demand for private household workers, on the other hand, employment is projected to decline because of the relatively low pay and status associated with these jobs.

Detailed information on the nature of the work, working conditions, employment, training requirements, job outlook, and earnings in many of the service occupations mentioned here is presented in the following statements.

Protective Service Occupations

A civilized society, if it is to survive, must safeguard the lives and property of its members. Protective service workers check crime, prevent and minimize loss of life and property, and enforce regulations that protect our safety and rights at home and on the job. In 1984, they held over 1.9 million jobs.

As the accompanying chart illustrates, about 3 out of 5 protective service workers are government employees—working primarily at the local level. Most of the remainder work in the services sector. Through the mid-1990's, employment of protective service workers is expected to increase faster than the average for all occupations. Rapid employment growth is projected for guards and correction officers, while average employment growth is projected for firefighting occupations and police officers and detectives.

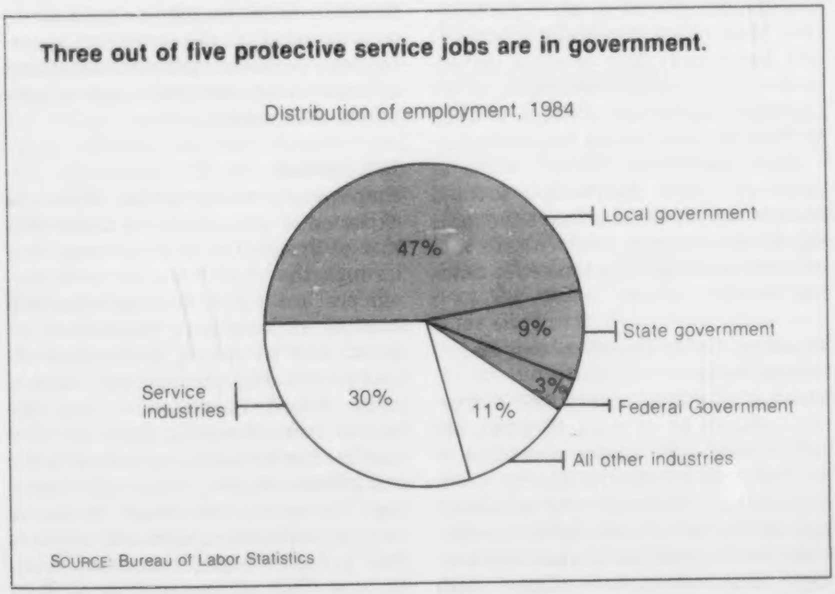
High school graduates are preferred for most protective service jobs, but persons with less formal education are occasionally hired as guards or correction officers if they read, write, and speak English adequately. However, an increasing number of entrants to protective service jobs have some postsecondary education. A relatively small number of workers, such as FBI special agents, must have at least a bachelor's degree. In any case, college training is an asset for advancement.

Most protective service workers must undergo formal training programs and get on-the-job experience before they are fully qualified. Training programs last from several days to a few months and emphasize specific job-related skills. Advancement may depend on job performance, additional education, seniority, and scores on written examinations.

Physical fitness, a sense of fairness, honesty, and an understanding of human nature are important personal qualities for these jobs. Furthermore, persons seeking careers in protective service occupations should desire to serve the community and be able to exercise good judgment under a variety of conditions.

Protective service workers face substantially higher risks of death or personal injury than most other occupations when confronting acts of violence, public disorder, or destruction of property. Most of the time, however, their jobs are routine in nature. Some afford an opportunity to exercise a great deal of responsibility, to work with a minimum of direct supervision, and to work outdoors. Because protecting lives and property is an around-the-clock responsibility, many protective service personnel work at night and on weekends.

This section describes the work of several protective service occupations: Correction officers, firefighting occupations, guards, and police officers and detectives.



Three out of five protective service jobs are in government.

Distribution of employment, 1984

Source: Bureau of Labor Statistics

Correction Officers

(D.O.T. 372.367-014, .567-014, .667-018, and .677; and 375.367)

Nature of the Work

Correction officers are charged with the safekeeping of persons who have been arrested, are awaiting trial, or who have been tried and convicted of a crime and sentenced to serve time in a correctional institution. They maintain order within the institution, enforce rules and regulations, and often supplement the counseling that inmates receive from mental health professionals.

To make sure inmates are orderly and obey rules, correction officers keep a close watch on everything the inmates do, such as working, exercising, eating, and bathing. They assign and supervise inmates' work assignments, as well as instruct and help them on specific tasks. Sometimes it is necessary to search inmates and their living quarters for weapons or drugs, to settle disputes between inmates, and to enforce discipline. Correction officers cannot show favoritism and must report any inmate who violates the rules. To prevent escapes, officers serve as guards on towers and at gates. They count inmates periodically to make sure all are present.

Correction officers inspect the facilities to assure the safety and security of the prisoners. They check cells and other areas of the institution for unsanitary conditions, fire hazards, and evidence of infraction of rules by inmates. Periodically, they inspect locks, window bars, grill doors, and gates for signs of tampering.

Correction officers report orally and in writing on inmate conduct and on the quality and quantity of work done by inmates. Officers also report disturbances, violations of rules, and any unusual occurrences. They usually keep a daily record of their activities. In some modern facilities, correction officers monitor the activities of prisoners from a centralized control center with the aid of sophisticated technical equipment.

Correction officers escort inmates to and from cells and other areas and admit and accompany authorized visitors within the facility. From time to time, they may inspect mail for contraband (prohibited items), administer first aid, or assist police authorities by investigating crimes committed within the institution and by searching for escaped inmates.

Counseling and helping inmates with problems are increasingly important parts of the correction officer's job. Correctional institutions usually employ psychologists and social workers to counsel inmates, but correction officers informally supplement the work of the professionals. Officers help inmates adjust to institutional life, prepare for later civilian life, and avoid future criminal behavior. They may arrange a change in a daily schedule so that an inmate can visit the library, help inmates get news of their families, talk over personal problems that may have led to committing a crime, or suggest where to look for a job after release from prison. In some institutions, officers have a more formal counseling role and may lead or participate in group counseling sessions.

Correction officers count inmates periodically to make sure all are present.

Correction sergeants directly supervise correction officers. They usually are responsible for maintaining security and directing the activities of a group of inmates during an assigned watch or in an assigned area.

Working Conditions

Correction officers may work indoors or outdoors, according to their duties. Some indoor areas are well lighted, heated, and ventilated, but others are overcrowded, hot, and noisy. Outdoors, weather conditions may be disgreeable. Working in a correctional institution can be stressful and hazardous; correction officers occasionally have been injured or killed during disturbances.

Correction officers usually work an 8-hour day, 5 days a week. Prison security must be provided around the clock, which means some officers work weekends, holidays, and nights. During emergencies, officers may work overtime.

Employment

Correction officers held about 130,000 jobs in 1984. More than half worked at State correctional institutions such as prisons, prison camps, and reformatories. Most of the remainder worked at city and county jails or other institutions run by local governments. A few thousand correction officers worked at Federal correctional institutions.

Most correction officers work in relatively large institutions located outside metropolitan areas, although a significant number work in jails and other smaller facilities located in cities and towns.

Training, Other Qualifications, and Advancement

Most institutions require that correction officers be at least 18 years old and have a high school education or its equivalent, or qualifying work experience. However, the minimum age is 21 in some institutions. In addition, correctional institutions increasingly seek correction officers with postsecondary education in psychology, criminology, and related fields—reflecting an increased emphasis on personal counseling and rehabilitation of inmates.

Correction officers must be in good health. Many States require candidates to meet formal standards of physical fitness, eyesight, and hearing. Strength, good judgment, and the ability to think and act quickly are assets. A few States require candidates to pass a written examination.

The Federal Government, as well as almost every State and a few localities, provides training for correction officers. Some States have special training academies. Most States, however, provide informal on-the-job training.

Academy trainees generally receive at least 4 to 8 weeks of instruction on institutional policies, regulations, and operations; counseling psychology, inmate behavior, and contraband; custody and security procedures; administrative responsibilities and preparation of reports; self-defense, including the use of firearms; and physical fitness training. On-the-job trainees receive 2 to 6 months of similar training in an actual job setting under an experienced officer. Experienced officers sometimes receive inservice training to keep abreast of new ideas and procedures.

With additional education, experience, or training, qualified officers may advance to correction sergeant or other supervisory, administrative, or counseling positions. Many correctional institutions require experience as a correction officer for other corrections positions. Officers sometimes transfer to related areas, such as probation and parole.

Job Outlook

Employment of correction officers is expected to increase much faster than the average for all occupations through the mid-1990's as additional officers are hired to supervise and counsel an increasing number of inmates and to relieve tensions in already crowded correctional institutions. Expansion and new construction of correctional facilities are also expected to create many new jobs for correction officers. Most job openings, however, will result from the need to replace experienced workers who retire or transfer to other occupations. Difficult working conditions and the availability of jobs in other corrections or protective service occupations contribute to a particularly high turnover rate.

Employment of correction officers is not usually affected by changes either in economic conditions or the overall level of government spending because security must be maintained in correctional institutions at all times. Even when corrections budgets are cut, correction officers are rarely laid off. With the high turnover in this occupation, staffs can be cut quickly just by not replacing those who leave.

Earnings

According to a 1984 survey by the International Personnel Management Association, earnings of correction officers varied widely by level of government. At the local level, correction officers had median earnings of $17,200 a year. Starting pay averaged $15,600 in jails and other county and municipal correctional institutions, and top earnings of correction officers averaged $20,200.

At the State level, correction officers had median earnings of $16,700 a year in 1984. Starting pay averaged $14,800, and maximum earnings averaged $20,200.

At the Federal level, the starting salary was $14,400 per year in 1985; correction sergeants and other supervisory officers could advance to maximum salaries of more than $34,000. The average salary for all Federal correction officers and correction sergeants was $20,100 in 1984.

Correction officers usually are provided uniforms or an allowance to purchase their own. Most are provided or can participate in hospitalization or major medical insurance plans; many officers can get disability and life insurance. Officers employed by the Federal Government and most State governments are covered by civil service systems or merit boards.

Related Occupations

A number of related careers are open to high school graduates who are interested in the protective services and the field of security. *Bailiffs* guard offenders and maintain order in courtrooms during proceedings. *Bodyguards* escort and protect people from injury or invasion of privacy. *House* or *store detectives* patrol business establishments to protect against theft and vandalism and to enforce standards of good behavior. *Security guards* protect government, commercial, and industrial property against theft, vandalism, illegal entry, and fire. *Police officers* and *deputy sheriffs* maintain law and order, prevent crime, and arrest offenders.

Other corrections careers are open to persons interested in working with offenders. *Probation* and *parole officers* counsel offenders, process their release from correctional institutions, and evaluate their progress in becoming productive members of society. *Recreation leaders* organize and instruct offenders in sports, games, arts, and crafts. Some related occupations are discussed elsewhere in the *Handbook*.

Sources of Additional Information

Information about entrance requirements, training, and career opportunities for correction officers may be obtained from Federal and State civil service commissions, State departments of correction, or nearby correctional institutions and facilities.

Information on corrections careers, as well as information about schools that offer criminal justice education, financial assistance, and job listings, is available from:

CONTACT, Inc., P.O. Box 81826, Lincoln, Neb. 68501.

Additional information on careers in corrections is available from:

The American Correctional Association, 4321 Hartwick Rd., College Park, Md. 20740.

Firefighting Occupations

(D.O.T. 373 except .117; 379.687-010; 452.134, .364-014, .687-014)

Nature of the Work

Every year, fires take thousands of lives and destroy property worth billions of dollars. Firefighters help protect the public against this danger. This statement gives information only about career firefighters; it does not cover the many thousands of volunteer firefighters in communities across the country.

During duty hours, firefighters must be prepared to respond to a fire and handle any emergency that arises. Because firefighting is dangerous and complicated, it requires organization and teamwork. At every fire, firefighters perform specific duties assigned by an officer such as a lieutenant, captain, or chief. They may connect hose lines to hydrants, operate a pump, or position ladders. Their duties may change several times while the company is in action. They may rescue victims and administer emergency medical aid, ventilate smoke-filled areas, operate equipment, and salvage the contents of buildings. Some firefighters operate fire apparatus, ambulances, emergency rescue vehicles, and fireboats.

Most fire departments also are responsible for fire prevention. They provide specially trained personnel to inspect public buildings for conditions that might cause a fire. They may check building plans, the number and working condition of fire escapes and fire doors, the storage of flammable materials, and other possible hazards. In addition, firefighters educate the public about fire prevention and safety measures. They frequently speak on this subject before school assemblies and civic groups, and, in some communities, they inspect private homes for fire hazards.

Between alarms, they have classroom training, clean and maintain equipment, conduct practice drills and fire inspections, and participate in physical fitness activities.

Working Conditions

Firefighters spend much of their time at fire stations, which usually have facilities for dining and sleeping. When an alarm comes in, firefighters must respond rapidly, regardless of the weather or hour. They may spend long periods at fires and other emergencies on their feet and outdoors, sometimes in adverse weather.

Firefighting is one of the most hazardous occupations. It involves risk of death or injury from sudden cave-ins of floors or toppling walls and from exposure to flames and smoke. Firefighters also may come in contact with poisonous, flammable, and explosive gases and chemicals.

In some cities, firefighters are on duty for 24 hours, then off for 48 hours, and receive an extra day off at intervals. In other cities, they work a day shift of 10 hours for 3 or 4 days, a night shift of 14 hours for 3 or 4 nights, have 3 or 4 days off, and then repeat the cycle. On average, firefighters work 50 hours a week. In addition, firefighters often work extra hours at fires and other emergencies. Fire lieutenants and fire captains work the

Firefighters risk injury from toppling walls, floor cave-ins, and exposure to smoke and flames.

same hours as the firefighters they supervise. Duty hours may include some time when firefighters are free to read and study.

Employment

Firefighters held about 308,000 jobs in 1984. More than 9 out of 10 worked in municipal fire departments. Some very large cities have several thousand firefighters, while many small towns have only a few. Some firefighters work in fire departments on Federal and State installations, including airports. Private firefighting companies employ a small number.

Training, Other Qualifications, and Advancement

Applicants for municipal firefighting jobs may have to pass a written test, a medical examination, and tests of strength, physical stamina, and agility. These examinations are open to persons who are at least 18 years of age and have a high school education or the equivalent. Those who receive the highest scores have the best chances for appointment. Extra credit usually is given for military service and education. Experience as a volunteer firefighter or in the Armed Forces and completion of community college courses in fire science also may improve an applicant's chances for appointment. In fact, in recent years an increasing proportion of entrants to this occuption have some postsecondary education.

As a rule, beginners in large fire departments are trained for several weeks at the department's training center. Through classroom instruction and practical training, the recruits study firefighting techniques, fire prevention, local building codes, and emergency medical techniques; also, they learn how to use axes, saws, chemical extinguishers, ladders, and other firefighting and rescue equipment. After completing this training, they are assigned to a fire company where they are evaluated during a probationary period.

A small but growing number of fire departments have accredited apprenticeship programs lasting 3 to 4 years. These programs combine formal, technical instruction with on-the-job training under the supervision of experienced firefighters. Technical instruction covers subjects such as firefighting techniques and equipment, chemical hazards associated with various combustible building materials, emergency medical techniques, and fire prevention and safety.

Most experienced firefighters continue to study to improve their job performance and prepare for promotion examinations. To progress to higher level positions, firefighters must acquire expertise in the most advanced firefighting equipment and techniques and in building construction, emergency medical techniques, writing, public speaking, management and budgeting procedures, and labor relations. Fire departments frequently conduct training programs, and many colleges and universities offer courses such as fire engineering and fire science that are helpful to firefighters. Many fire captains and other supervisory personnel have college training.

Among the personal qualities firefighters need are mental alertness, courage, mechanical aptitude, endurance, and a sense of public service. Initiative and good judgment are extremely important because firefighters often must make quick decisions in emergency situations. Because members of a crew eat, sleep, and work closely together under conditions of stress and danger, they should be dependable and able to get along well with others in a group. Leadership qualities are assets for officers, who must establish and maintain discipline and efficiency as well as direct the activities of firefighters in their companies.

Opportunities for promotion are good in most fire departments. As firefighters gain experience, they may advance to a higher rank. After 3 to 5 years of service, they may become eligible for promotion to the grade of lieutenant. The line of further promotion usually is to captain, then battalion chief, assistant chief, deputy chief, and finally to chief. Advancement generally depends upon scores on a written examination, performance on the job, and seniority.

Job Outlook

Employment of firefighters is expected to increase about as fast as the average for all occupations through the mid-1990's due to the increase in the Nation's fire protection needs. Employment should rise as new fire departments are formed and as others enlarge their fire prevention sections. Little employment growth is expected in large, urban fire departments. Much of the expected increase will occur in smaller communities with expanding populations that replace volunteer with career firefighters to better meet growing, increasingly complex fire protection needs. Some local governments are expected to contract for firefighting services with private companies.

Turnover of firefighter jobs is unusually low, particularly for an occupation that requires a relatively limited investment in formal education. Nevertheless, most job openings are expected to result from the need to replace those who retire, transfer from the occupation, or stop working for other reasons.

Firefighting attracts many people because a high school education is sufficient, earnings are relatively high, a pension is guaranteed upon retirement, and promotion is possible to progressively more responsible positions on the basis of merit. In addition, the work is frequently exciting and challenging and affords an opportunity to perform a valuable public service. Consequently, the number of qualified applicants in most areas generally exceeds the number of job openings, even though the written examination and physical requirements eliminate many applicants. This situation is expected to persist through the mid-1990's. Opportunities should be best in smaller communities.

Layoffs of firefighters are not common. Fire protection is an essential service, and citizens are likely to exert considerable pressure on city officials to expand or at least preserve the level of fire-protection coverage. Even when budget cuts do occur, local fire departments usually cut expenses by postponing equipment purchases or the hiring of new firefighters, rather than by laying off staff.

Earnings

According to a 1984 survey by the International Personnel Management Association, nonsupervisory firefighters had a median salary of about $19,600 a year, but their earnings varied considerably depending on city size and region of the country. Earnings for firefighters are lowest in the South and highest in the West, and generally are higher in large cities than in small ones. Entrance salaries for beginning full-time firefighters averaged about $17,300 a year, while maximum salaries averaged nearly $22,300 a year.

Fire lieutenants had a median annual salary of about $24,100 in 1984. Their starting annual salaries averaged nearly $22,200, and maximum salaries about $26,100.

Fire captains had a median salary of more than $26,400 a year in 1984. They started at an average annual salary of about $24,600, and could advance to an average maximum salary of about $29,400. Some fire captains had salaries in excess of $52,300 a year.

Practically all fire departments provide protective clothing (helmets, boots, and coats) and many also provide dress uniforms.

Firefighters generally are covered by liberal pension plans that often provide retirement at half pay at age 50 after 25 years of service or at any age if disabled in the line of duty.

The majority of career firefighters are members of the International Association of Fire Fighters (AFL-CIO).

Related Occupations

Firefighters work to prevent fires and to save lives and property when fires do occur. Related fire protection occupations include fire rangers and fire-protection engineers who identify fire hazards in homes and workplaces and design prevention programs and automatic fire detection and extinguishing systems. Other occupations in which workers respond to emergencies include police officers and emergency medical technicians.

Sources of Additional Information

Information on obtaining a job as a firefighter is available from local civil service offices or fire departments.

Information about a career as a firefighter may be obtained from:

International Association of Fire Chiefs, 1329 18th St. NW., Washington, D.C. 20036.

International Association of Fire Fighters, 1750 New York Ave. NW., Washington, D.C. 20006.

Information about firefighter professional qualifications may be obtained from:

National Fire Protection Association, Batterymarch Park, Quincy, Mass. 02269.

Additional information on the salaries and hours of work of firefighters in various cities is published annually by the International City Management Association in its *Municipal Yearbook*, which is available in many libraries.

Guards

(D.O.T. 372.563, .567-010, .667-010, -014, and -030 through -038; 376.667-010; and 379.667-010)

Nature of the Work

Guards patrol and inspect property to protect against fire, theft, vandalism, and illegal entry. Their duties vary with the size, type, and location of their employer.

In office buildings, banks, hospitals, and department stores, guards protect records, merchandise, money, and equipment. In department stores, they often work with undercover detectives watching for theft by customers or store employees.

At ports, airports, and railroads, guards protect merchandise being shipped as well as property and equipment. They insure that nothing is stolen while being loaded or unloaded, and watch for fires, prowlers, and trouble among work crews. Sometimes they direct traffic.

Guards who work in public buildings, such as museums or art galleries, protect paintings and exhibits. They also answer routine questions from visitors and sometimes guide traffic.

In factories, laboratories, government buildings, data processing centers, and military bases where valuable property or information must be protected, guards check the credentials of persons and vehicles entering and leaving the premises. University, park, or recreation guards perform similar duties and also may issue parking permits and direct traffic.

At social affairs, sports events, conventions, and other public gatherings, guards maintain order, give information, and watch for persons who may cause trouble.

In a large organization, a security officer often is in charge of the guard force; in a small organization, a single worker may be responsible for security. Patrolling usually is done on foot, but if the property is large, guards may make their rounds by car or motor scooter.

As they make their rounds, guards check all doors and windows, see that no unauthorized persons remain after working hours, and insure that fire extinguishers, alarms, sprinkler systems, furnaces, and various electrical and plumbing systems are working properly. They sometimes set thermostats or turn on lights for janitorial workers.

Guards usually are uniformed and often carry a nightstick and gun. They also may carry a flashlight, whistle, two-way radio, and a watch clock—a device that indicates the time at which they reach various checkpoints.

Correction officers—guards who work in prisons and other correctional institutions—are discussed separately in this section of the *Handbook*.

Working Conditions

Guards work indoors and outdoors patrolling buildings, industrial plants, and grounds. Indoors, they may be stationed at a guard desk to monitor electronic security and surveillance devices or check the credentials of persons entering or leaving the premises. They also may be stationed at gate shelters or may patrol grounds in all weather.

Guards provide protection against fire, theft, vandalism, and illegal entry.

Since guards often work alone, no one is nearby to help if an accident or injury occurs. Some large firms, therefore, use a reporting service that enables guards to be in constant contact with a central station outside the plant. If they fail to transmit an expected signal, the central station investigates. Guard work is usually routine, but guards must be constantly alert for threats to themselves and to the property that they are protecting. Guards who work during the day may have a great deal of contact with other employees and members of the public.

Many guards work alone at night; the usual shift lasts 8 hours. Some employers have three shifts where guards rotate to divide daytime, weekend, and holiday work equally. Guards usually eat on the job instead of taking a regular break.

Employment

Guards held about 733,000 jobs in 1984. Industrial security firms and guard agencies employed about one-half of all guards. These organizations provide security services on contract, assigning their guards to buildings and other sites as needed. The other half were in-house guards, employed in large numbers by banks; building management companies; hotels; hospitals; retail stores; restaurants and bars; schools, colleges, and universities; and Federal, State, and local governments.

Although guard jobs are found throughout the country, most are located in metropolitan areas.

Training, Other Qualifications, and Advancement

Most employers prefer guards who are high school graduates. Applicants with less than a high school education also can qualify if they pass reading and writing tests and demonstrate competence in following written and oral instructions. Some jobs require a driver's permit. Employers also seek people who have had experience in the military police or in State and local police departments. Most persons who enter guard jobs have prior work experience, although it is usually unrelated. Because of limited formal training requirements and flexible hours, this occupation attracts many persons seeking a second job. For some entrants, retired from military careers or other protective services, guard employment is a second career.

Applicants are expected to have good character references, no police record, good health—especially in hearing and vision—and good personal habits such as neatness and dependability. They should be mentally alert and emotionally stable. Guards must be physically fit to cope with emergencies.

Candidates for guard jobs in the Federal Government must have some experience as a guard and pass a written examination. Armed Forces experience also is an asset. For most Federal guard positions, applicants must qualify in the use of firearms.

The amount of training guards receive varies. Training requirements generally are increasing as modern, highly sophisticated security systems become more commonplace. Many employers give newly hired guards instruction before they start the job and also provide several weeks of on-the-job training. Guards at nuclear power plants may undergo several months of training before being placed on duty under close supervision. Guards may be taught to use firearms, to administer first aid, to operate alarm systems and electronic security equipment, and to spot and deal with security problems. Guards who are authorized to carry firearms may be periodically tested in their use according to State or local laws. Some guards are periodically tested for strength and endurance.

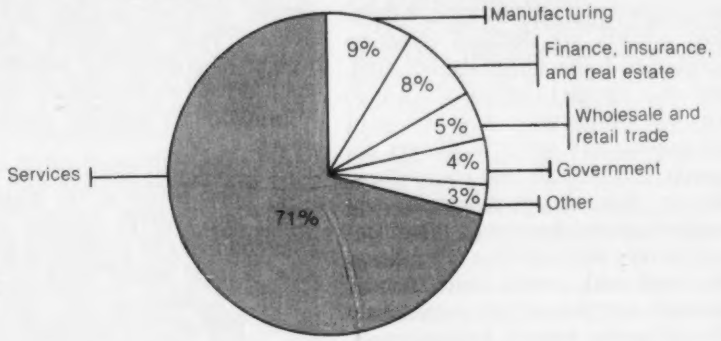
Although guards in small companies receive periodic salary increases, advancement is likely to be limited. However, most large organizations use a military type of ranking that offers advancement in position and salary. Guard experience enables some persons to transfer to police jobs that offer higher pay and greater opportunities for advancement. Guards with some college education may advance to jobs that involve administrative duties or the prevention of espionage and sabotage. A few guards with management skills open their own contract security guard agencies.

Job Outlook

Job openings for persons seeking work as guards are expected to be plentiful through the mid-1990's. High turnover in this large occupation makes it rank among those providing the great-

While most protective service jobs are in government, guards are concentrated in firms that provide guard services on a contract basis.

Distribution of guard employment, 1984



SOURCE: Bureau of Labor Statistics

est number of job openings in the entire economy. Many opportunities are expected for persons seeking full-time employment, as well as for those seeking part-time or second jobs at night or on weekends. However, competition is expected for in-house guard positions. Compared to contract security guards, in-house guards enjoy higher earnings and benefits, greater job security, and more advancement potential, and are usually given more training and responsibility.

Employment of guards is expected to grow faster than the average for all occupations through the mid-1990's, although not as rapidly as in recent years. Growth will be tempered by the use of technologically advanced electronic security systems that have greater alarm and monitoring capability and are more reliable than earlier systems.

The level of business investment in increasingly expensive plant and equipment has a major influence on how many guards will be required. Greater investment would cause greater growth in the number of guard jobs. Increased concern about crime, vandalism, and terrorism will also heighten the need for security in and around plants, stores, offices, and recreation areas. Because engaging the services of a security guard firm is easier and less costly than assuming direct responsibility for hiring, training, and managing a security guard force, job growth is expected to be concentrated among contract security guard agencies.

Guards employed by industrial security and guard agencies occasionally are laid off when the firm where they work does not renew its contract with their agency. Most are able to find employment with other agencies, however. Guards employed directly by the firm at which they work are seldom laid off because a plant or factory must still be protected even when economic conditions force it to close temporarily.

Earnings

Guards working in 23 urban areas averaged an estimated $5.25 an hour in 1984. Those working in the Midwestern States earned more than the average, while guards employed in the South earned somewhat less. Hourly wages of guards were estimated to average $9.24 in manufacturing; $9.16 in public utilities; $7.17 in banking, finance, insurance, and real estate; $7.08 in wholesale trade; $6.08 in retail trade; and $4.34 in the various service industries, including security and guard agencies. Guards with specialized training or some supervisory responsibilities averaged $7.71 an hour, while those with less training and responsibility averaged $4.96 an hour. Guards employed by industrial security and guard agencies generally started at or slightly above the minimum wage, $3.35 an hour in 1984.

Depending on their experience, newly hired guards in the Federal Government earned between $11,500 and $12,900 a year in 1985. Guards employed by the Federal Government averaged $15,000 a year in 1984. These workers usually receive overtime pay as well as a wage differential for the second and third shifts. Many guards have paid vacations, sick leave, and insurance and pension plans.

Related Occupations

Guards protect property, maintain security, and enforce regulations for entry and conduct in the establishments at which they work. Related security and protective service occupations include: Bailiffs, border guards, correction officers, deputy sheriffs, fish and game wardens, house or store detectives, police officers, and private investigators.

Sources of Additional Information

Further information about work opportunities for guards is available from local employers and the nearest State employment service office.

Information about Federal Government contract guard job requirements is included in the *Contract Guard Information Manual*, Publication No. 1984-438-028:18101, and may be purchased from the U.S. Government Printing Office, Washington, D.C. 20402.

Police and Detectives

(D.O.T. 168.167-010; 372.137, .167-018, .363, .367-010; 375.133 through .137-018, .137-026 through .167-014, -022, -030 through -046, .263 through .363, .384; and 377.264)

Nature of the Work

The safety of our Nation's cities, towns, and highways greatly depends on the work of police and detectives, whose responsibilities range from controlling traffic to preventing and investigating crimes. Whether on or off duty, these officers are expected to exercise their authority whenever necessary.

As civilian police department employees and private security personnel increasingly assume routine police duties, police and detectives are able to spend more time fighting serious crime. Police and detectives are also becoming more involved in public relations—increasing public confidence in the police and instructing the public in the best ways to help the police fight crime.

Police and detectives who work in small communities and rural areas have many duties. In the course of a day's work, they may direct traffic at the scene of a fire, investigate a housebreaking, and give first aid to an accident victim. In a large police department, by contrast, officers usually are assigned to a specific type of duty. Most officers are detailed either to patrol or to traffic duty; smaller numbers are assigned to special work such as accident prevention or operation of communications systems. Others are experts in chemical and microscopic analysis, firearms identification, and handwriting and fingerprint identification. In very large cities, a few officers may work with special units such as mounted and motorcycle police, harbor and border patrols, helicopter patrols, canine corps, mobile rescue teams, and youth aid services.

Detectives and special agents are plainclothes investigators who gather facts and collect evidence for criminal cases. They conduct interviews, examine records, observe the activities of suspects, and participate in raids or arrests.

State police officers (sometimes called State troopers or highway patrol officers) patrol highways and enforce laws and regulations that govern their use. They issue traffic tickets to motorists who violate the law. At the scene of an accident, they direct traffic, give first aid, call for emergency equipment including ambulances, and write reports which may be used to determine the cause of the accident. In addition, State police officers provide services to motorists on the highways. For example, they radio for road service for drivers with mechanical trouble, direct tourists to their destination, or give information about lodging, restaurants, and tourist attractions.

Police officers are required to file accurate, detailed accounts of accidents.

State police officers also provide traffic assistance and control during road repairs, fires, and other emergencies, as well as during special occurrences such as parades and sports events. They sometimes check the weight of commercial vehicles, conduct driver examinations, and give information on highway safety to the public.

In addition to highway responsibilities, State police in the majority of States also enforce criminal laws. In communities and counties that do not have a local police force or a large sheriff's department, the State police are the primary law enforcement agency, investigating crimes such as burglary or assault. They also may help city or county police catch lawbreakers and control civil disturbances. State highway patrols, however, normally are restricted to apprehending criminals on State highways, and to vehicle safety and traffic matters.

Most new police recruits begin on patrol duty, riding in a police vehicle or walking on "foot" patrol. They may work alone or with other officers in such varied areas as congested business districts or outlying residential neighborhoods. In any case, new officers become thoroughly familiar with conditions throughout their area and, while on patrol, remain alert for anything unusual. They note suspicious circumstances, such as open windows or lights in vacant buildings, as well as hazards to public safety such as burned-out street lights or fallen trees. Officers enforce traffic regulations and also watch for stolen automobiles. At regular intervals, officers report to police headquarters from call boxes, radios, or walkie-talkies.

Police and detectives also write reports and maintain police records. They may testify in court when their arrests result in legal action. Some officers, such as division or bureau chiefs, are responsible for training or certain kinds of criminal investigations, and those who command police operations in an assigned area have administrative and supervisory duties.

Working Conditions

Police and detectives usually work 40 hours a week. Because police protection must be provided around the clock in all but the smallest communities, some officers work weekends, holidays, and nights. Police officers are subject to call any time their services are needed and may work overtime during emergencies.

Police officers may have to work outdoors for long periods in all kinds of weather. The injury rate among police and detectives is higher than in many occupations and reflects the risks officers take in pursuing speeding motorists, apprehending criminals, and dealing with public disorders.

Employment

Police and detectives held about 520,000 jobs in 1984. Most were employed by local governments, primarily in cities with more than 25,000 inhabitants. Some cities have very large police forces, while hundreds of small communities employ fewer than 25 officers each. State police and investigative agencies employed about 10 percent of the officers and detectives; various Federal agencies, such as the Federal Bureau of Investigation and the Secret Service, employed an additional 5 percent.

Training, Other Qualifications, and Advancement

Civil service regulations govern the appointment of police and detectives in practically all States and large cities and in many small ones. Candidates must be U.S. citizens, usually at least 21 years of age, and must meet rigorous physical and personal qualifications. Eligibility for appointment depends on performance in competitive written examinations as well as on education and experience. Physical examinations often include tests of vision, strength, and agility.

Because personal characteristics such as honesty, good judgment, and a sense of responsibility are especially important in police and detective work, candidates are interviewed by a senior officer at police headquarters, and their character traits and background are investigated. In some police departments, candidates also may be interviewed by a psychiatrist or a psychologist, or be given a personality test. Although police and detectives work independently, they must perform their duties in accordance with laws and departmental rules. They should enjoy working with people and serving the public.

In large police departments, where

most jobs are found, applicants usually must have a high school education. An increasing number of cities require some college training, and some hire law enforcement students as police interns. A few jobs, such as special agents for the Federal Bureau of Investigation or the Internal Revenue Service, require a college degree. A few police departments accept applicants who have less than a high school education as recruits, particularly if they have worked in a field related to law enforcement.

More and more, police departments are encouraging applicants to take post-high school training in law enforcement. Many entrants to police and detective jobs have completed some formal postsecondary education; a significant number are college graduates. Many junior colleges, colleges, and universities offer programs in law enforcement or administration of justice. Other courses helpful in preparing for a police career include psychology, counseling, English, American history, public administration, public relations, sociology, business law, chemistry, physics, and driver education. Physical education and sports are especially helpful in developing the stamina and agility needed for police work. Knowledge of a foreign language is an asset in certain areas.

Some large cities hire high school graduates who are still in their teens as civilian police cadets or trainees. They do clerical work and attend classes and are appointed to the regular force at age 21 if qualified.

Before their first assignments, officers usually go through a period of training. In small communities, recruits work for a short time with experienced officers. In State and large city police departments, they get more formal training that may last several weeks or a few months. This training includes classroom instruction in constitutional law and civil rights, State laws and local ordinances, and accident investigation. Recruits also receive training and supervised experience in patrol, traffic control, use of firearms, self-defense, first aid, and handling emergencies.

Police officers usually become eligible for promotion after a probationary period ranging from 6 months to 3 years. In a large department, promotion may allow an officer to become a detective or specialize in one type of police work such as laboratory analysis of evidence, traffic control, communications, or working with juveniles. Promotions to sergeant, lieutenant, and captain usually are made according to a candidate's position on a promotion list, as determined by scores on a written examination and on-the-job performance.

Many types of training help police officers and detectives improve their job performance and advancement. Through training given at police department academies and colleges, officers keep abreast of crowd-control techniques, civil defense, legal developments that affect their work, and advances in law enforcement equipment. Many police departments offer higher salaries and pay all or part of the tuition for officers to work toward college associate and bachelor's degrees in law enforcement, police science, administration of justice, or public administration.

Job Outlook

Employment of police officers and detectives is expected to increase about as fast as the average for all occupations through the mid-1990's due to the increase in the Nation's population and police protection needs. However, employment growth will be tempered by increased use of civilian police department employees in parking enforcement and various clerical, administrative, and technical support positions. In addition, private security firms will increasingly assume some routine police duties such as crowd surveillance at airports and other public places. Although turnover of police and detective jobs is among the lowest of all occupations, the need to replace workers who retire, transfer to other occupations, or stop working for other reasons will be the source of most job openings.

Police work is attractive to many. The job frequently is challenging and involves much responsibility. Furthermore, in some communities, police officers may retire with a pension to pursue a second career before age 50. Although written examinations and strict physical requirements always eliminate many applicants, competition is expected to remain keen for job openings through the mid-1990's. Most State and local police departments have long lists of qualified candidates. The outlook should be best for persons having some college training in law enforcement.

The level of government spending influences the employment of police officers and detectives. Layoffs are rare because early retirements enable most staffing cuts to be handled through attrition. However, police officers who lose their jobs from budget cuts usually have little difficulty finding jobs with other police departments.

Earnings

According to a 1984 survey by the International Personnel Management Association, police patrol officers had a median annual salary of $20,500. They started at an average of $18,000 a year and could reach an average maximum of $23,400 a year.

Police and detective sergeants had a median annual salary of $24,800 in 1984. They started at an average of $22,700 a year and could advance to an average maximum of $27,400 a year. Police and detective lieutenants had a median annual salary of $28,100 and started at an average of $25,400 a year. With experience and satisfactory job performance, they could advance to an average maximum salary of $30,900 a year in 1984.

Police departments usually provide officers with special allowances for uniforms and furnish revolvers, nightsticks, handcuffs, and other required equipment. Because police officers generally are covered by liberal pension plans, many retire at half pay after 20 or 25 years of service.

Related Occupations

Police officers maintain law and order in the Nation's cities, towns, and rural areas. Workers in related law enforcement occupations include guards, bailiffs, correction officers, deputy sheriffs, fire marshals, fish and game wardens, and U.S. marshals.

Sources of Additional Information

Information about entrance requirements may be obtained from Federal, State, and local civil service commissions or police departments.

Food and Beverage Preparation and Service Occupations

This section of the *Handbook* deals with workers who prepare and serve food and beverages in restaurants, catering firms, hotels, clubs, bars, factories, school cafeterias, hospitals, rest homes, and other establishments. These workers cook and serve food, mix and serve drinks, and do many other related tasks. Since so many of these jobs involve dealing with the public, tact, courtesy, and a pleasant personality are important. The work is often hectic, and the ability to work efficiently under pressure while maintaining an even disposition and a sense of humor is necessary. Stamina is also very important, since most of these workers spend long periods of time on their feet and sometimes carry heavy loads of food and dishes.

Food and beverage preparation and service workers make up one of the largest occupational groups in the Nation's labor force. They accounted for over 6.6 million jobs in 1984—almost five times as many jobs as in the steel and motor vehicle manufacturing industries combined. Part-time workers account for about one-half of total employment in these occupations. Vacation resorts employ many of these workers on a seasonal basis.

Job opportunities exist almost everywhere and for almost any interested person, including those who have limited skills or little formal education. The widespread availability of part-time jobs which easily fit into people's schedules makes these occupations attractive to students, homemakers, and others who want a job as a source of immediate income rather than a career.

Skills usually are learned through on-the-job training. Many restaurants hire inexperienced persons as waiters' assistants, kitchen helpers, food counter workers, waiters and waitresses, or bartenders. Previous employment as a kitchen helper or assistant cook sometimes is necessary, however, to get a job in a large restaurant or catering firm. Also, courses in cooking, catering, and bartending offered by public and private vocational schools can be helpful. Experienced workers may advance to food service manager, maitre d'hotel, head cook, or chef. Completion of a college program in hotel and restaurant administration is valuable for the top managerial positions.

Starting pay for many of these jobs is very low. However, tips may add substantially to income.

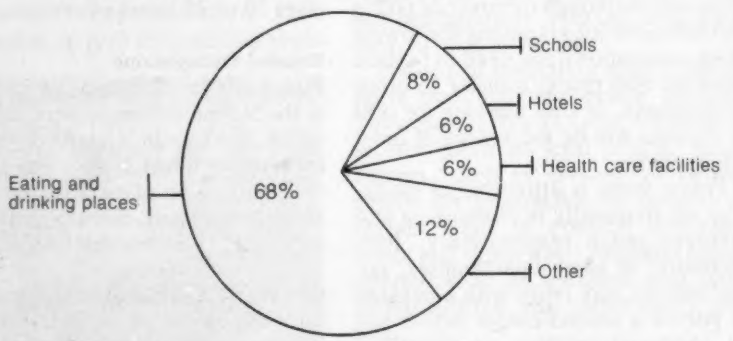
Although employment of these workers is expected to increase faster than the average for all occupations through the mid-1990's, the overwhelming majority of job openings are expected to result from replacement needs. A large proportion of food and beverage preparation and service workers transfer to other occupations, leave the labor force to assume household duties, or return to school each year.

New jobs will be created as additional restaurants, cafeterias, and bars open in response to population growth and increased spending for food and beverages outside the home. Higher average incomes and more leisure time will enable people to dine out and take vacations more often. Also, as more women work, more families may find dining out a welcome convenience.

Detailed discussions of the work, training, job outlook, and earnings of bartenders, chefs and cooks, except short order, and waiters and waitresses are presented in the statements that follow.

Besides eating and drinking places, schools, hotels, and health care facilities employ large numbers of food and beverage preparation and service workers.

Distribution of wage and salary employment, 1984



SOURCE: Bureau of Labor Statistics

Bartenders

(D.O.T. 312.474; .477; and .677)

Nature of the Work

A skillful bartender can prepare your drink at a moment's notice. It may be a cool, sparkling glass of champagne or a colorful, exotic mixture such as a Singapore Sling. Bartenders make these concoctions by combining, in exact proportions, ingredients selected from what may seem to be a bewildering variety of alcoholic beverages, mixes, and garnishes. A well-stocked bar contains dozens of types and brands of liquors, beer, and wines, plus soft drinks, fruits and fruit juices, cream, and soda and tonic water.

Bartenders fill the drink orders that waiters and waitresses take from customers seated in the restaurant or lounge, as well as orders from customers seated at the bar. Because some people like their cocktails made a certain way, bartenders often are asked to mix drinks to suit a customer's taste. Most bartenders must know dozens of drink recipes and, by sight alone, be able to mix drinks accurately, quickly, and without waste, even during the busiest periods. Besides mixing and serving drinks, bartenders collect payment, operate the cash register, clean up after customers have left, and may also serve food items to customers seated at the bar.

More establishments, especially larger ones, are using automatic equipment to mix drinks of varying complexity at the push of a button. However, bartenders still must be efficient and knowledgeable to handle unusual orders and to work when the automatic equipment is not functioning. Also, equipment is no substitute for the friendly socializing most customers prefer.

Bartenders usually are responsible for ordering and maintaining an inventory of liquor, mixes, and other bar supplies. They also arrange the bottles and glassware into attractive displays and often wash glassware used at the bar.

Some bartenders own the tavern or bar and, therefore, also must keep their own business records and hire, train, and direct staff.

Working Conditions

Many bartenders work more than 40 hours a week, and night and weekend work and split shifts are common. Bartenders have to work quickly and under pressure in a popular bar during busy periods. For many bartenders, however, the opportunity for friendly conversation with customers, the relative ease of changing jobs, and the possibility of someday managing or owning a bar or restaurant more than offset these disadvantages. For others, the opportunity to get part-time work is important—for example, college students or other persons seeking supplemental income.

Employment

Seventy percent of the 400,000 jobs held by bartenders in 1984 were in restaurants and bars; about 20 percent were in hotels and private clubs. Most of the rest were in amusement and recreation establishments. Less than 1 bartender in 10 was self-employed.

One out of every three bartenders works part time. Part-time work may involve bartending at banquets and private parties at restaurants, hotels, clubs, or even in private homes.

Seasonal employment is available in vacation resorts, and some bartenders migrate between summer and winter resorts rather than remain in one area the entire year.

Training, Other Qualifications, and Advancement

Most bartenders learn their trade on the job. Although preparing drinks at home can be good practice, it does not qualify a person to be a bartender. Besides knowing a variety of cocktail recipes, bartenders must know how to stock a bar properly and be familiar with State and local laws concerning the sale of alcoholic beverages.

Persons who wish to become bartenders can acquire related experience by working as bartenders' helpers, waiters' assistants, or waiters or waitresses. By watching a bartender at work, they can learn how to mix drinks and do other bartending tasks. However, one must practice to become proficient.

Some people acquire their skills by attending a bartending school or taking vocational and technical school courses that include instruction on State and local laws and regulations, cocktail recipes, attire and conduct, and stocking a bar. Some of these schools help their graduates find jobs.

Generally, bartenders must be at least 21 years of age. Some employers prefer those who are 25 or older. Since they deal with the public, bartenders should have a pleasant personality and a neat and clean appearance. Stamina and strength also are necessary, because they stand while working and may be required to lift heavy kegs of beer or cases of beverages. Some States require bartenders to have health certificates assuring that they are free of contagious diseases. In some instances, they must be bonded.

Small restaurants, neighborhood bars, and resorts usually offer a beginner the best opportunities. After gaining experience, a bartender may wish to work in a large restaurant or cocktail lounge where pay is higher and opportunities for promotion are greater. Although opportunities for promotion in this field are limited, it is possible to advance to head bartender, wine steward, or beverage manager. Some bartenders open their own businesses.

Bartenders should have a pleasant personality and a neat, clean appearance.

Job Outlook

Job opportunities for bartenders are expected to be plentiful. Because many bartenders are students, homemakers, or others who do not plan careers in this occupation, job turnover is very high. As a result, most job openings will arise from the need to replace bartenders who transfer to other occupations or stop working for a variety of reasons.

Employment of bartenders is expected to increase faster than the average for all occupations through the mid-1990's, as new restaurants, hotels, and bars open in response to increased spending on food and beverages outside the home.

Earnings

In 1984, median annual earnings (excluding tips) of full-time bartenders were $10,600. The middle 50 percent earned from $8,800 to $14,800; the top 10 percent earned at least $18,100. Besides wages, bartenders may receive tips that substantially increase their earnings. Bartenders often receive free meals at work and may be furnished bar jackets or complete uniforms.

In some large hotels, bartenders belong to unions. The principal union is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

Related Occupations

Bartenders' duties include taking orders, serving drinks, and collecting payment from customers. Other workers who serve customers in a similar way include short-order cooks, food counter workers, and waiters and waitresses.

Sources of Additional Information

Information about job opportunities may be obtained from local employers and the local offices of the State employment service.

General information about bartenders is available from:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

A directory of colleges and other schools offering programs and courses in hospitality education is available from:

Council on Hotel, Restaurant, and Institutional Education, Room S-208, Henderson Building, University Park, Pa. 16802.

Chefs and Cooks, Except Short Order

(D.O.T. 313.281-010; .361-014, -018, -030, and -034; .381-022, -030, and -034; 315.361-010, -018, -022; .371; and .381)

Nature of the Work

A reputation for serving fine food is an asset to any restaurant or hotel, whether it prides itself on "home cooking" or exotic foreign cuisine. Chefs and cooks are largely responsible for the reputation a restaurant acquires. Some restaurants offer a varied menu featuring meals that are time consuming and difficult to prepare, requiring a highly skilled cook or chef. Other restaurants emphasize fast service, offering hamburgers and sandwiches that can be prepared in a few minutes by a short-order cook with only limited cooking skills. Short-order cooks are not included in this *Handbook* statement.

Besides restaurants, chefs and cooks work for hotels, caterers, and for various institutions such as schools, hospitals, and cafeterias throughout industry and government. Professional chefs are the most highly skilled, trained, and experienced members of this occupation, although the terms chef and cook are often used interchangeably. Many chefs have earned fame for both themselves and the restaurants and hotels where they work because of their skill in artfully preparing the traditional favorites and in creating new dishes and improving familiar ones.

The duties of a chef or cook depend partly on the size and kind of restaurant. Smaller restaurants usually feature a limited number of easy-to-prepare items, supplemented by short-order specialties and readymade desserts. Typically, one chef or cook prepares all of the food with the help of a short-order cook and one or two kitchen helpers.

Large eating places usually have more varied menus and prepare, from start to finish, more of the food they serve. Kitchen staffs often include several chefs or cooks, sometimes called assistant or apprentice chefs or cooks, and many kitchen helpers. Each chef or cook usually has a special assignment and often a special job title—pastry, fry, or sauce cook, for example. Head chefs or cooks coordinate the work of the kitchen staff and often direct certain kinds of food preparation. They decide the size of servings, sometimes plan menus, and buy food supplies.

Working Conditions

Many restaurant and institutional kitchens have modern equipment, convenient work areas, and air-conditioning; but others, particularly in older and smaller eating places, are frequently not as well equipped. Other variations in working conditions depend on the type and quantity of food being prepared and the local laws governing food service operations. In most kitchens, cooks must stand most of the time, lift heavy pots and kettles, and work near hot ovens and ranges. Hours in restaurants may include late evening, holiday, and weekend work, while hours in cafeterias in factories, schools, or other institutions may be more regular. Cooks employed in public and private schools may work during the school year only, usually for 9 or 10 months. Vacation resorts offer seasonal employment for cooks and chefs.

Job hazards include falls, cuts, and burns, but injuries are seldom serious.

Employment

Chefs and cooks, except short order, held 884,000 jobs in 1984. About 40 percent worked in restaurants and 30 percent worked in educational institutions. About 1 of 6 jobs was in a hotel or health care institution. Government agencies, factories, private clubs, and many other organizations also employed chefs and cooks. More than one-third worked part time.

Training, Other Qualifications, and Advancement

Many chefs and cooks start work as a short-order cook or in an unskilled position such as kitchen helper and acquire their skills on the job; however, an increasing number are obtaining their training through high school or post-high school vocational programs and 2- or 4-year colleges. Chefs and cooks may also be trained in apprenticeship programs offered by professional culinary institutes, industry associations, and trade unions. An example is the 3-year apprenticeship program administered by local chapters of the American Culinary Federation in cooperation with local employers and junior colleges or vocational education institutions. In addition, some large hotels and restaurants operate their own training programs for new employees.

Only a short period of training or experience is required to become an assistant or fry cook, but many years of training and experience are necessary to achieve the level of skill required of an executive chef or cook in a fine restaurant. Even though a high school diploma is not required for beginning jobs, it is recommended for those planning a career as a cook or chef. High school or vocational school courses in business arithmetic and business administration are particularly helpful. To get experience, high school students can work part time in fast-food or other restaurants.

Persons who have had courses in commercial food preparation will have an advantage when looking for jobs in large restaurants and hotels, where hiring standards often are high. Some vocational programs in high schools offer this kind of training. But usually these courses, which range from a few months to 2 years or more and are open in some cases only to high school graduates, are given by trade schools, vocational centers, colleges, professional associations, and trade unions. The Armed Forces also are a good source of training and experience.

Although curricula may vary, students usually spend most of their time learning to prepare food through actual practice. They learn to bake, broil, and otherwise prepare food, and to use and care for kitchen equipment. Training programs often include courses in menu planning, determination of portion size and food cost control, purchasing food supplies in quantity, selection and storage of food, and use of leftovers. Students also learn hotel and restaurant sanitation and public health rules for handling food. Training in supervisory and management skills sometimes is emphasized in courses offered by private vocational schools, professional associations, and university programs.

Many school districts, in cooperation with school food services divisions of State departments of education, provide on-the-job training and sometimes summer workshops for cafeteria workers who wish to become cooks. Some junior colleges, State departments of education, and school associations also offer training programs. Cafeteria employees who have participated in these training programs often are selected for jobs as cooks.

Certification provides valuable formal recognition of the skills of a chef or cook. The American Culinary Federation certifies chefs and cooks at the levels of cook, chef, pastry chef, executive chef, and master chef. Certification standards are based primarily on experience and formal training.

Persons who want to become cooks or chefs should be able to work as part of a team and to withstand the pressure and strain of working in close quarters during busy periods. A keen sense of taste and smell, the stamina to stand for hours at a time, and personal cleanliness also are important qualifications. Most States require health certificates indicating that cooks and chefs are free from contagious diseases.

Advancement opportunities for cooks are better than for most other food and beverage preparation and service occupations. Many cooks acquire higher paying positions and new cooking skills by moving from one operation to another. Others gradually advance to chef positions or supervisory or management positions, particularly in hotels, clubs, or the larger, more elegant restaurants. Some eventually go into business as caterers or restaurant owners; others may become instructors in vocational programs in high schools, junior and community colleges, and other academic institutions.

Job Outlook

Job openings for chefs and cooks are expected to be plentiful. Employment growth will create many new jobs, and additional openings will arise from the need to replace cooks and chefs who transfer to other occupations or stop working for a variety of reasons.

Employment of chefs and cooks is expected to increase faster than the average for all occupations through the mid-1990's. Contributing to demand will be population growth, higher family and personal incomes, and more leisure time that will allow people to dine out and take vacations more often. Also, as more women join the work force, families increasingly may find dining out a welcome convenience.

Many chefs earn fame from their preparation of traditional favorites or creation of new dishes.

Employment of restaurant chefs and cooks is expected to grow rapidly. Increasing demand for restaurants that offer table service and varied menus, particularly more expensive restaurants that offer more exotic foods, will require highly skilled cooks and chefs.

Employment of institution and cafeteria cooks is expected to increase about as fast as the average for all occupations due to the anticipated moderate growth in educational services, where the majority are concentrated. However, employment is expected to increase rapidly in nursing homes, residential care facilities, and other health care institutions that serve the growing number of elderly people.

Earnings

In 1984, median annual earnings of full-time chefs and cooks, except short order, were $9,400. The middle 50 percent earned between $7,600 and $12,300; the top 10 percent earned at least $17,100.

Wages of chefs and cooks vary depending on the part of the country and, especially, the type of establishment in which they work. Wages generally are highest in large, well-known restaurants and hotels. Chefs and cooks in famous restaurants, of course, earn much more than the above salaries; those with national reputations earn $40,000 or more a year. Employers generally provide free meals and uniforms.

In some large hotels and restaurants, chefs and cooks belong to unions. The principal union is the Hotel Employees and Restaurant Employees International Union (AFL-CIO).

Related Occupations

Chefs and cooks may manage large restaurant or hotel kitchens employing dozens of people. Other workers with similar management responsibilities include food service directors, executive housekeepers, and pursers. In addition, chefs and cooks in expensive restaurants create and then present a product to its best advantage. Workers in other occupations whose work must be creative and attractively presented include artists, bakers, clothes designers, and decorators.

Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the State employment service.

Career information about chefs and cooks, as well as a directory of junior and senior colleges that offer courses or programs that prepare persons for food service careers, is available from:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

For information on the American Culinary Federation's apprenticeship and certification programs for cooks, write to:

American Culinary Federation, P.O. Box 3466, St. Augustine, Fla. 32084.

For career information and a directory of accredited private trade and technical schools offering programs in the culinary arts, write to:

National Association of Trade and Technical Schools, 2251 Wisconsin Ave. NW., Washington, D.C. 20007.

For a directory of colleges and other schools offering programs and courses in hospitality education, write to:

Council on Hotel, Restaurant, and Institutional Education, Room S-208, Henderson Building, University Park, Pa. 16802.

Waiters and Waitresses

(D.O.T. 310.357; 311.477-018 through -030; .674-018; 350.677-010, -026, and -030; and 352.677-018)

Nature of the Work

Whether they work in small, informal diners or large, fancy restaurants, all waiters and waitresses deal with customers. The quality of service they provide determines in part whether the patron is likely to return. Waiters and waitresses all perform essentially the same tasks—taking customers' orders, serving food and beverages, making out checks, and sometimes taking payments—but the manner in which they go about them may vary considerably, depending on where they work. In coffee shops, they are expected to provide fast, efficient service. In restaurants where meals are served elaborately and a great deal of emphasis is placed on the satisfaction and comfort of each guest, waiters and waitresses serve food at a more leisurely pace and offer more personal service to their customers. For example, they may suggest a certain kind of wine as a complement to a particular entree and may explain how items on the menu are prepared.

Depending on the type of restaurant, waiters and waitresses may perform duties in addition to waiting on tables. These tasks may include setting up and clearing tables and carrying soiled tableware to the kitchen. Although very small restaurants usually combine waiting on tables with counter service or cashiering, larger or more formal restaurants frequently relieve their waiters and waitresses of these additional duties.

Working Conditions

Some waiters and waitresses work split shifts—that is, they work for several hours during the middle of the day, take a few hours off in the afternoon, and then return to their jobs for the evening hours. Most are expected to work on holidays and weekends. The wide range in dining hours creates a good opportunity for flexible part-time work schedules attractive to students, homemakers, and others. The majority of waiters and waitresses work part time, a larger proportion than in almost any other occupation. Waiters and waitresses are on their feet most of the time and often have to carry heavy trays of dishes and food. During dining hours, they may have to rush to serve several tables at once. The work is relatively safe, but they must be careful to avoid slips or falls and burns.

Employment

Waiters and waitresses held more than 1.6 million jobs in 1984. Nearly four-fifths worked in restaurants; about 10 percent worked in hotels; and others worked in recreational, social, and other clubs. Jobs are located throughout the country but are most plentiful in large cities and tourist areas. Vacation resorts offer seasonal employment, and some waiters and waitresses alternate between summer and winter resorts instead of remaining in one area the entire year.

Training, Other Qualifications, and Advancement

There are no specific educational requirements for waiter and waitress jobs, although many employers prefer to hire high school graduates. Most waiters and waitresses pick up their skills on the job, learning to set tables, take orders from customers, and serve food in a courteous and efficient manner. Some advance to this job after working as a waiter's assistant, carhop, or food counter worker, but many persons are able to enter this occupation without related work experience. Experience waiting on tables is preferred by restaurants and hotels which have rigid table service standards. Jobs at these establishments often have higher earnings, but may also have higher educational standards than less formal establishments.

Most employers place an emphasis on personal qualities. Waiters and waitresses should be well spoken and have a neat and clean appearance because they are in close and constant contact with the public. An even disposition is also important since they must serve customers quickly and under pressure during busy periods. Waiters and waitresses should enjoy dealing with all kinds of people. A good memory is essential to avoid confusing customers' orders and to recall the faces, names, and preferences of frequent patrons. Stamina is necessary, as waiters and waitresses are on their feet for hours at a time, lifting and carrying trays of food from kitchen to table. Waiters and waitresses also should be good at arithmetic if they have to total bills without the aid of a calculator. In restaurants specializing in foreign foods, knowledge of a foreign language is helpful. State laws often require waiters and waitresses to obtain health certificates showing that they are free of contagious diseases.

Some public and private vocational schools, restaurant associations, and large restaurant chains provide classroom training in a generalized food service curriculum. Other employers use self-instruction programs to teach new employees food preparation and service skills through the use of audiovisual presentations and instructional booklets.

For many persons, a job as a waiter or waitress serves as a source of immediate income rather than a career. Many entrants to the occupation are in their late teens or early twenties and have a high school education or less. Usually, they have little or no work experience. Many are full-time students or homemakers.

Due to the small size of most food-serving establishments, opportunities for promotion are limited. After gaining some experience, however, a waiter or waitress may transfer to a larger restaurant where earnings and prospects for advancement are better. Advancement can be to supervisory jobs, such as host or hostess, maitre d' hotel, or dining room supervisor. Some supervisory workers advance to jobs as restaurant managers.

Job Outlook

Job openings for waiters and waitresses are expected to be plentiful through the mid-1990's. Most openings will arise from the need to replace the high proportion of waiters and waitresses who leave this very large occupation each year. There is substantial movement into and out of the occupation due to the limited formal education and training requirements and predominance of part-time jobs. Many waiters and waitresses simply move to other occupations; others stop working to assume household responsibilities or to attend school.

Employment of waiters and waitresses is expected to grow faster than the average for all occupations through the mid-1990's. Demand will stem from population growth, rising personal incomes, and increased leisure time which, combined, will create more business for restaurants. Also, as more women join the work force, families may increasingly find dining out a welcome convenience.

The best opportunities for employment will be in moderately priced restaurants. Because potential earnings are greatest in expensive restaurants, keen competition exists for the jobs that become available in these establishments.

Earnings

In 1984, median annual earnings (excluding tips) of full-time waiters and waitresses were $9,400. The middle 50 percent earned between $6,600 and $12,000; the top 10 percent earned at least $15,500. For many waiters and waitresses, however, tips are greater than hourly wages. Tips generally average between 10 and 20 percent of guests' checks. Most waiters and waitresses receive meals at work, and many are furnished with uniforms.

In some large hotels, waiters and waitresses belong to unions. The principal union is the Hotel Employees Restaurant Employees International Union (AFL-CIO).

Related Occupations

Other workers whose jobs involve serving customers and helping them feel at ease and enjoy themselves include flight attendants, butlers, counter workers, hosts and hostesses, and bellhops.

Waiters and waitresses may explain how dishes are prepared or suggest a certain wine as a complement to an entree.

Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the State employment service.

General information on waiter and waitress jobs is available from:

National Institute for the Foodservice Industry, 20 North Wacker Dr., Suite 2620, Chicago, Ill. 60606.

For a directory of colleges and schools offering programs and courses in hospitality education, write to:

Council on Hotel, Restaurant, and Institutional Education, Room S208, Henderson Building, University Park, Pa. 16802.

Health Service Occupations

Health service workers assist health professionals such as physicians, dentists, optometrists, nurses, and therapists. They typically perform routine but essential tasks that involve a great deal of personal contact: Conversing with patients, making them comfortable, and setting them at ease. Depending on their place of work, they might make appointments, greet patients, keep records, set up equipment, deliver food trays, change bed linen, transport patients, help them do exercises, and escort those who cannot walk unassisted.

Little formal training is required, although some workers prepare by completing 1- or 2-year programs offered by community colleges, vocational-technical institutes, and trade schools. Employers generally provide all the necessary training on the job. While high school graduates are preferred, employers do not always insist on a diploma. More important are the personal traits these jobs require: Dependability, common sense, emotional stability, a cheerful disposition, and willingness to assume responsibility. Physical effort is involved, and at times the work is strenuous, tiring, and stressful.

Nursing aides and psychiatric aides make up the largest of these occupations; they held nearly 1.3 million jobs in 1984. Much of their workday is spent answering patients' bell calls, delivering and collecting food trays, and helping patients with bathing, dressing, grooming, and meals. In nursing homes and mental hospitals, aides provide most of the direct patient care. *Ambulance drivers* and *ambulance attendants* also provide essential services.

Physical therapists, occupational therapists, and recreational therapists also work with the support of *assistants* and *aides*. The different job titles reflect different levels of training and expertise. Assistants have more formal preparation than aides; many are graduates of 2-year associate degree programs. Assistants help the therapist test patients and administer treatments. Aides are less directly involved in diagnosis and treatment. Instead, they help patients dress and undress, organize and maintain the equipment, make appointments, and perform other clerical duties.

There were almost 300,000 medical or dental assisting jobs in 1984. Assistants usually work in the office of a practitioner, and handle a combination of office and patient care duties. *Optometric assistants* and *ophthalmic medical assistants*, for example, maintain records, give preliminary eye examinations, and help patients do prescribed exercises. *Dental assistants* held 169,000 jobs in 1984 and *medical assistants* held 128,000 jobs. (Medical assistants should not be confused with physician assistants, highly skilled health professionals who undergo several years of rigorous training to acquire their skill in patient care. Their work is described elsewhere in the *Handbook*.) Other assisting jobs include those of *chiropractor assistant* and *podiatric assistant*.

Employment in many of these occupations is expected to grow faster than the average for all occupations through the mid-1990's. This reflects anticipated demand for health care services on the part of a growing and longer living population, and continued emphasis on using support personnel to increase the productivity of highly trained practitioners. Most job openings, however, will result from replacement needs, which will continue to be substantial. Turnover in these occupations tends to be very high, in part because entry requirements are minimal and pay scales are low. Growth rates and job prospects are not the same for all the health service occupations; see the *Handbook* statements that follow for information on specific occupations.

Dental Assistants

(D.O.T. 079.371-010)

Nature of the Work

Dental assistants work with dentists as they examine and treat patients. The assistant makes the patient comfortable in the dental chair, prepares him or her for treatment, and obtains dental records. The assistant hands the dentist the proper instruments and materials and keeps the patient's mouth dry and clear by using suction or other devices. Assistants sterilize and disinfect instruments and equipment; prepare tray setups for dental procedures; provide post-operative instruction; and instruct patients in oral health practices. Some dental assistants prepare materials for making impressions and restorations, expose radiographs, and process dental X-ray film as directed by the dentist.

Dental assistants may perform a variety of laboratory, clinical, and office duties; some make casts of the teeth and mouth from impressions taken by the dentist. In some States, assistants apply medications to the teeth and oral tissue, remove excess cement used in the filling process, and place rubber dams on the teeth to isolate them for individual treatment. In small, single-dentist practices, dental assistants may manage the office and arrange and confirm appointments, receive patients, keep treatment records, send bills, receive payments, and order dental supplies and materials. In group dental practices, assistants may take on one or more of these functions in addition to working with the dentists.

The work of the dental assistant should not be confused with that of the dental hygienist, who is licensed to scale and polish teeth. (See the statement on dental hygienists elsewhere in the *Handbook*.)

Working Conditions

Dental assistants work in a well-lighted, clean environment. Handling radiographic equipment poses dangers, but the hazards can be minimized by proper use of lead shielding and safety procedures.

Dental assistants, like dentists, work in either a standing or sitting position. Their work area is near the dental chair, so that they can arrange instruments, materials, and medica-

Dental assistants serve as a dentist's "third hand."

tion, and hand them to the dentist when needed. They must be a dentist's "third hand," and, therefore, should exhibit some manual dexterity and be able to deal with people who may be under stress.

Although the 40-hour workweek prevails for dental assistants, the schedule is likely to include work on Saturday.

Employment

Dental assistants held about 169,000 jobs in 1984. About 1 out of 4 worked part time, sometimes in more than one dentist's office.

Most dental assistants work in private dental offices, either for individual dentists or for groups of dentists. Others work in dental schools, hospital dental departments, State and local public health departments, or private clinics. The Federal Government employs dental assistants in hospitals and dental clinics of the U.S. Public Health Service and the Veterans Administration.

Training, Other Qualifications, and Advancement

Dental assisting is an entry level job. The principal requirements are a congenial personality and the ability to learn the job. Consequently, entrants to this occupation tend to be young; for many, it is their first experience in the world of work.

About 2 out of 5 dental assistants learn their skills on the job and an equal number are trained in dental assisting programs offered by community and junior colleges, trade schools, and technical institutes. Some assistants are trained in Armed Forces schools.

About 290 formal training programs were accredited by the American Dental Association's Commission on Dental Accreditation in 1984. More than three-fourths of the programs take 1 year to complete and lead to a certificate or diploma. Graduates of 2-year programs offered in community and junior colleges earn an associate degree. The minimum requirement for any of these programs is a high school diploma or its equivalent. Some schools require typing or a science course for admission. Some private vocational schools offer 4- to 6-month courses in dental assisting, but these are not accredited by the dental profession. Those receiving dental assistant training in the Armed Forces usually qualify for civilian jobs as dental assistants.

High school students interested in careers as dental assistants should take courses in biology, chemistry, health, typing, and office practices.

Accredited dental assisting programs include classroom, laboratory, and preclinical instruction in dental assisting skills and related theory. In addition, students gain practical experience in affiliated dental schools, local clinics, or selected dental offices.

A correspondence course offered by the University of North Carolina School of Dentistry is also available. This course is designed for dental assistants who are learning on the job or who otherwise are unable to participate in accredited training programs on a full-time basis. The correspondence program is equivalent to 1 academic year of study but generally requires about 2 years to complete.

Certification is available through the Dental Assisting National Board. Certification is an acknowledgment of an assistant's qualifications and professional competence, but is not generally required for employment. In several States that have set standards for dental assistants who perform radiologic procedures, completion of the certification examination meets those standards.

High school graduates may qualify to take the certification examination by graduating from a training program accredited by the Commission on Dental Accreditation; having 1 academic year of postsecondary education and 2 years of full-time experience as a dental assistant; or having 5 years of full-time experience as a dental assistant. In addition, all applicants must have taken a course in cardiopulmonary resuscitation.

Some dental assistants seek to qualify for practice as dental hygienists. Prospective dental assistants who foresee this possibility should plan carefully, since credit earned in a dental assistant program often is not applicable toward requirements for a dental hygiene certificate. Some dental assistants become sales representatives for firms that manufacture dental products. The field of dental assisting education offers opportunities in teaching and program administration.

Job Outlook

Employment of dental assistants is expected to grow faster than the average for all occupations through the mid-1990's. Demand for dental care is expected to continue to rise because of population growth, rising real incomes, and more widespread availability of dental insurance. Provided they have a large enough practice, dentists have a powerful incentive to hire assistants—if they delegate routine tasks to dental assistants, they can use their time for more remunerative procedures.

A sharp decline in patient load would lead dentists to perform more functions themselves and hire fewer support staff. This is a possibility in view of improvements in dental health due to fluoridation and other forms of preventive dentistry, together with the rapidly expanding supply of dentists. Should such a decline occur, employment growth would be somewhat slower than currently expected.

Most job openings will be created by the need to replace assistants who leave the occupation. Since dental assisting offers relatively low pay and limited advancement, a large proportion of dental assistants leave the occupation annually. Qualified applicants should have little trouble locating a job. This is largely an occupation of young women, and many of them leave the job to take on family responsibilities. Others return to school or transfer to other occupations. Few leave for retirement or disability.

Earnings

Salaries of dental assistants depend largely on the duties and responsibilities attached to the particular job and on geographic location. Dentists' policies with respect to salaries vary widely, but there is little evidence that individuals who have completed a formal training program in dental assisting command higher pay.

In 1984, median earnings for dental assistants working full time were about $225 a week, according to a survey by the American Dental Association.

In the Federal Government, experience and the amount and type of education determine starting salaries. In 1985, a high school graduate who had 6 months of experience started at $11,458 a year; graduates of a 1-year accredited dental assisting program who had a year of general experience could expect to start at nearly $12,900 a year. Dental assistants working for the Federal Government earned average salaries of about $15,200 in 1984.

Related Occupations

Dental assistants perform a variety of duties that do not require the dentist's professional knowledge and skill. Other workers who provide similar services under the supervision of a health practitioner include medical assistants, chiropractor assistants, optometric assistants, podiatric assistants, and surgical technicians.

Sources of Additional Information

Information about career opportunities, scholarships, accredited dental assistant programs, and requirements for certification is available from:

American Dental Assistants Association, 666 N. Lake Shore Dr., Suite 1130, Chicago, Ill. 60611.

Commission on Dental Accreditation, American Dental Association, 211 E. Chicago Ave., Suite 1814, Chicago, Ill. 60611.

Dental Assisting National Board, Inc., 666 N. Lake Shore Dr., Suite 1136, Chicago, Ill. 60611.

Medical Assistants

(D.O.T. 079.364-010, -014, and -022, .367-010, and .374-018)

Nature of the Work

Medical assistants help physicians examine and treat patients and perform routine tasks needed to keep the office running smoothly.

The duties of a medical assistant may be administrative, clinical, or both. The size of the office determines the scope of the job: those in small offices typically handle both clerical and clinical duties, whereas in offices with a sizable staff, medical assistants usually specialize in either the office or patient care aspects of the job.

Clinical duties most commonly include: Recording patients' height, weight, temperature, and blood pressure; obtaining medical histories; performing basic laboratory tests; preparing patients for examination or treatment; assisting the physician in examining patients; and sterilizing instruments. Other clinical duties may be instructing patients about medication and self-treatment, drawing blood, preparing patients for X-rays, taking EKG's, and applying dressings.

Medical assistants also may arrange instruments and equipment in the examining room; check office and laboratory supplies; and maintain the waiting, consulting, and examination rooms in a neat and orderly condition.

Medical assistants perform a variety of administrative duties. They may answer the telephone, greet patients and other callers, record and file patient data and medical records, fill out medical reports and insurance forms, handle correspondence, schedule appointments, and arrange for hospital admission and laboratory services. Along with other office duties, they may transcribe dictation and handle the bookkeeping and billing. Increasingly, medical assistants perform routine clerical tasks—such as recordkeeping and billing—on automated office equipment, primarily word processors and personal computers (microcomputers).

Medical secretaries and medical receptionists also perform administrative tasks in medical offices, but, unlike medical assistants, they rarely have clinical duties. (See the statements on secretaries and receptionists elsewhere in the *Handbook*.)

Medical assistants employed in hospitals or outpatient facilities, like those who work in practitioners' offices, perform a variety of tasks. For instance, they may assist physicians in emergency departments by providing direct care to patients. In addition, they may process paperwork without the direct supervision of a physician, for example, in the admissions or medical records departments.

Medical assistants known as *ophthalmic medical assistants* help ophthalmologists to care for eyes. They take medical histories, use precision instruments to administer diagnostic tests, measure eyes, and test eye functioning. At times, they provide technical assistance to ophthalmologists during eye surgery. These workers change eye dressings, administer eye drops or oral medications, and teach patients how to insert, remove, and care for contact lenses. Sometimes, they may help ophthalmologists dispense eyeglasses and contact lenses. Among their other duties are caring for and maintaining optical and surgical instruments.

Working Conditions

Medical assistants work in a well-lighted, clean environment. They need to be careful when performing clinical work, such as sterilizing equipment or doing laboratory tests.

Employment

Medical assistants held about 128,000 jobs in 1984. Most jobs were in the offices of physicians and other health practitioners, including optometrists, podiatrists, and chiropractors. The remaining jobs were in hospitals, clinics, health maintenance organizations, and other facilities. The following tabulation shows the distribution of wage and salary jobs in 1984:

	Percent
Total	100
Offices of physicians (M.D.'s and D.O.'s)	67
Hospitals	14
Offices of other health practitioners	9
Outpatient care facilities	4
All other	6

Training, Other Qualifications, and Advancement

Medical assistants often are trained on the job. Applicants usually need a high school diploma or the equivalent. High school courses in mathematics, health, biology, typing, bookkeeping, computers, and office practices are helpful.

Many medical assistants receive their training in formal programs offered in some high schools and, at the postsecondary level, by vocational-technical institutes, trade schools, community and junior colleges, and universities. Community college and university programs in medical assisting usually last 2 years and lead to an associate degree; the other programs take up to 1 year to complete and graduates receive a diploma or certificate.

Two agencies are recognized by the U.S. Department of Education to accredit programs in medical assisting: The Committee on Allied Health Education and Accreditation (CAHEA) and the Accrediting Bureau of Health Education Schools (ABHES). The 165 medical assisting and 8 ophthalmic medical assisting programs approved by CAHEA graduated about 6,300 students in 1984. The ABHES accredits 134 medical assisting programs, and graduates numbered about 7,100 in 1984. The curriculum in these programs consists of courses in biology, anatomy and physiology, typing, transcription, accounting, records and recordkeeping, and medical terminology. Many students receive instruction in computer skills as they apply to the medical office. Students also receive supervised clinical experience and learn laboratory techniques, use of medical equipment, clinical procedures, and first-aid techniques. In addition, students receive instruction in administrative and office practices including communications skills, human relations, and medical law and ethics.

There are no licensing requirements for medical assistants. Gaining credentials, which is voluntary, consists of certification offered by professional organizations upon successful completion of an examination. The American Association of Medical Assistants (AAMA) awards the Certified Medical Assistant (CMA) credential, the American Medical Technologists awards the Registered Medical Assistant (RMA) credential, and the Joint Commission on Allied Health Personnel in Ophthalmology awards the Ophthalmic Medical Assistant credential at three levels: Certified Ophthalmic Assistant, Certified Ophthalmic Technician, and Certified Ophthalmic Technologist.

Medical assistants help with simple clinical procedures.

For medical assistants, advancement often means leaving the occupation, for career lines are short. Clinical health occupations such as radiologic technologist or registered nurse require additional clinical education, whereas administrative and managerial jobs may not. Medical assistants who demonstrate leadership abilities may, for example, be promoted to the position of office manager. (The trend toward group practice, clinics, freestanding emergency centers, and other alternatives to solo practice is likely to heighten demand for office managers.) Medical assistants with computer skills are qualified for a wide variety of research and management support positions.

A neat, well-groomed appearance and a courteous, pleasant manner are necessary traits for medical assistants, who have a great deal of contact with the public. Communication skills are especially important. Medical assistants must not only be good at putting patients at ease, but be good listeners and interpret a physician's instructions correctly the first time they are given. Conscientiousness, a sense of responsibility, and respect for the confidential nature of medical information are all necessary qualities in a medical assistant. Clinical duties require a reasonable level of manual dexterity and visual acuity. Medical assistants must be able to deal with people who are under stress.

Job Outlook

Employment of medical assistants is expected to grow much faster than the average for all occupations through the mid-1990's. Contributing to future job growth is the projected increase in the number of practicing physicians, together with extremely rapid growth in outpatient care facilities, such as urgent care centers and surgicenters. The increased complexity and volume of the paperwork associated with medical care also will spur demand. Most job openings, however, will result from the need to replace experienced assistants who leave the occupation.

In view of the preference of many physicians for trained personnel, job prospects should be very good for medical assistants with formal training, experience, or both. Employers view formal certification favorably. Medical assistants with word processing and computer skills will have an advantage.

Earnings

The earnings of medical assistants vary widely. The assistant's qualifications and experience and the size and location of the physician's practice all help to determine the level of pay. Inexperienced medical assistants started at about $7,000 a year in 1984, according to data collected by the American Medical Association. Experienced medical assistants earned as much as $15,000 a year; average earnings were about $10,300.

Although medical assistants usually work 40 hours a week, some work on Saturday may be required.

Related Occupations

Workers in other health occupations that entail a combination of administrative and clinical duties include orthoptists, pharmacy helpers, dental assistants, occupational therapy aides, and physical therapist aides.

Sources of Additional Information

Information about career opportunities, CAHEA-accredited educational programs in medical assisting, and requirements for the Certified Medical Assistant exam is available from:

The American Association of Medical Assistants, 20 North Wacker Dr., Suite 1575, Chicago, Ill. 60606.

Information about career opportunities and requirements for becoming a Registered Medical Assistant is available from:

American Medical Technologists, Registered Medical Assistants, 710 Higgins Rd., Park Ridge, Ill. 60068.

For a list of ABHES-accredited educational programs in medical assisting, write:

Accrediting Bureau of Health Education Schools, Oak Manor Office, 29089 U.S. 20 West, Elkhart, Ind. 46514.

Information about career opportunities, training programs, and requirements to become a Certified Ophthalmic Assistant is available from:

Joint Commission on Allied Health Personnel in Ophthalmology, 1812 N. St. Paul Rd., St. Paul, Minn. 55109.

Nursing Aides and Psychiatric Aides

(D.O.T. 354.374-010, .377-010, and .677-010; 355.377-014 and -018, .674-014 and -018)

Nature of the Work

Nursing aides and psychiatric aides help care for people who are physically or mentally ill, disabled, or infirm. Their job duties vary depending on the work setting and the characteristics of their patients.

Typical duties of nursing aides in general hospitals, sometimes known as nursing assistants, orderlies, or hospital attendants, include answering patients' bell calls and delivering messages, serving meals, feeding patients who are unable to feed themselves, making beds, and bathing and dressing patients. Aides also may give massages, take temperatures, and assist patients in getting out of bed and walking. In some hospitals, they may help registered nurses and licensed practical nurses care for patients. The work depends on whether the patient is confined to bed after major surgery, is recovering after a disabling accident or illness, or needs assistance in daily activities because of advanced age. At times they may have to escort patients to operating and examining rooms or store and move supplies in hospital pharmacies or supply rooms.

Nursing aides employed in nursing homes, sometimes referred to as geriatric aides, perform many of the same tasks as their counterparts in general hospitals. However, because the patients often stay for months or even years, the nursing aide must be able to sustain ongoing personal relationships with them. Often such patients are confused and disoriented, which requires that the aide respond in a positive, caring way. For example, in nursing homes that have reality orientation and resocialization programs, aides play an important role in reinforcing the strategies designed by the professional staff.

Nursing aides employed by home health programs, usually known as home health aides, provide personal as well as nursing care to patients in their homes. Besides caring for the patient, these aides have to work closely with the family. Reliability, honesty, and good judgment are essential since they work without direct supervision.

Psychiatric aides, known also as mental health assistants, psychiatric nursing assistants, or ward attendants, are found in a variety of settings: State and county mental hospitals, private psychiatric hospitals, psychiatric units of general hospitals, community mental health centers, residential facilities for the mentally retarded, halfway houses, and, increasingly, drug abuse and alcoholism treatment programs. They work as part of a team that may include many kinds of mental health professionals, such as psychiatrists, psychologists, psychiatric nurses, social workers, and various types of therapists. In addition to their personal care duties—helping dress, bathe, groom, and feed patients—psychiatric aides spend a lot of time with patients. They may play cards or other games with patients, talk with them and encourage them, participate in activities with them, and, in general, strive to implement the treatment plan designed by the professional staff. They observe the patients and report any meaningful signs or actions to the professional staff. If necessary, they help restrain and seclude unruly, disturbed patients. Because they are the staff members in closest contact with patients, psychiatric aides can greatly influence patients' outlook and treatment by being patient, understanding, and emotionally supportive.

Working Conditions

With few exceptions, the scheduled workweek of aides in hospitals and nursing homes is 40 hours or less. Because patients need care 24 hours a day, scheduled work hours include evenings, nights, weekends, and holidays. Workers spend many hours standing and may have to move patients in bed or help them stand or walk.

Nursing aides often empty bed pans, change soiled bed linens, and care for disoriented and irritable patients. Psychiatric aides sometimes are confronted with violent patients. Such experiences can be emotionally draining. Many gain personal satisfaction, however, from assisting those in need.

Employment

Nursing aides held about 1,204,000 jobs in 1984, while psychiatric aides held about 64,000 jobs. Most wage and salary jobs were in hospitals or nursing homes, as the accompanying chart shows. About a quarter of all aide jobs are part time.

Training, Other Qualifications, and Advancement

These are entry level jobs that do not ordinarily require work experience. Educational requirements are minimal. Although employers prefer high school graduates, many, such as Veterans Administration medical centers, do not require a high school diploma. Employers often accept applicants who are 17 or 18 years of age.

In addition to providing young people with an entry to the world of work, these occupations offer good opportunities for middle-aged and older individuals who do not have a high school diploma.

The fact that personal qualifications such as warmth, dependability, and maturity outweigh formal educational requirements is a distinctive feature of these occupations. However, hiring requirements are beginning to change in the direction of more formal preparation.

In many States, nursing aides must be certified. To receive certification, they must pass an approved course of instruction from a State-approved school. These courses, which range in length from 65 to 240 hours, are offered in high schools, vocational education schools, and schools affiliated with nursing homes. Subjects taught include body mechanics, nutrition, anatomy and physiology, infection control, and communications skills.

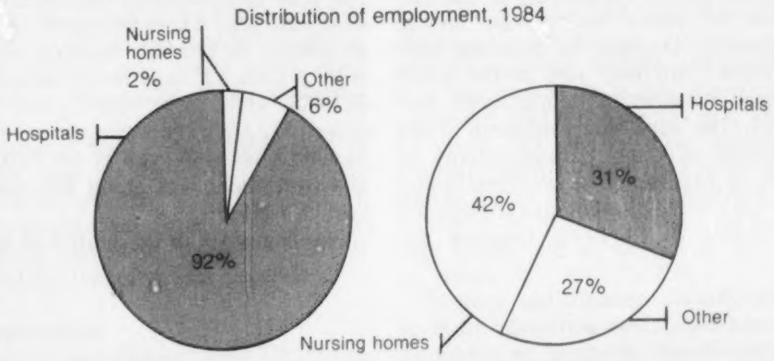
In States which do not require certification, nursing aides generally are trained after they are hired. Some institutions combine on-the-job training, under registered nurses or licensed practical nurses, with classroom instruction. Trainees learn to take and record temperatures, bathe patients, change linens on beds occupied by patients, and move and lift patients. Initial training may last several days or a few months, depending on the policies of the institution, the complexity of the duties, and the aide's aptitude for the work. Psychiatric aides, for example, are taught interpersonal relations, group dynamics, and socialization techniques to enable them to work constructively with the mentally ill. Opportunities for learning continue, even after the initial orientation or training period ends; most aides are required to attend lectures, workshops, and other forms of in-service training from time to time.

Courses in home nursing and first aid, offered by many public school systems and other community agencies, provide a useful background of knowledge for the work. Volunteer work and temporary summer jobs in hospitals and similar institutions also are helpful. Applicants should be healthy, tactful, patient, understanding, emotionally stable, and dependable. Nursing aides and psychiatric aides, as other health workers, should have a genuine desire to help people, be able to work as part of a team, and be willing to perform repetitive, routine tasks.

Opportunities for advancement within these occupations are limited. Career ladders, where they exist at all, are very short. Nonetheless, the large and growing health industry—which comprises hundreds of occupations and employment settings—offers career opportunities for aides who undertake additional training. Experience in health care almost invariably is an asset when applying for such training, which is offered by community colleges, vocational-technical institutes, and trade schools. Hospital occupations requiring approximately 1 year of training beyond high school include surgical technician, licensed practical nurse, EEG

Assisting at mealtime is an important part of a nursing aide's job.

Most psychiatric aides work in hospitals, but fewer than a third of nursing aides do.



SOURCE: Bureau of Labor Statistics

technologist, EKG technician, respiratory therapy technician, clinical laboratory assistant, and dietetic technician. Many of these are discussed elsewhere in the *Handbook*.

Job Outlook

Job prospects for nursing aides and psychiatric aides are expected to be good through the mid-1990's. Growth in demand for these workers and the need to replace experienced workers who leave their jobs will create far more openings than in most other occupations.

Employment of nursing aides is expected to grow faster than the average for all occupations in response to the health care needs of a growing and aging population. Opportunities should be best in nursing homes and home health agencies, due to the anticipated expansion of long-term care for people with chronic illnesses and disabling conditions, many of whom are elderly.

Employment of these workers in hospitals is expected to decline due to shifts in staffing patterns as hospitals concentrate on providing intensive, high-technology care to seriously ill patients. Patients who are not quite so ill, and those in need of continued care after a hospital stay, will be treated elsewhere—in a rehabilitation unit, a nursing home, or at home. For this reason, long-term care settings are expected to replace hospitals as the principal employer of nursing aides by 1995.

Employment of psychiatric aides is expected to grow more slowly than the average for all occupations. As in the past, job prospects for aides will be tied almost exclusively to the outlook for public and private mental hospitals. Demand for inpatient psychiatric care may rise in the years ahead because of demographic factors. The very sharp increase in the number of older persons—many of whom experience severe depression or are unable to recognize friends and relatives—is likely to increase demand, as is the movement of the large baby-boom generation through young adulthood, a time of life when schizophrenia and other severe mental illnesses peak. However, employment in public mental hospitals is not likely to grow much, if at all, due to constraints on public spending and continued support for a policy of deinstitutionalization, which has "emptied" State hospitals and diverted new admissions for more than 20 years. Demand for inpatient care in private psychiatric facilities is likely to grow somewhat, however, for several reasons. Among them are broad third-party coverage for acute psychiatric episodes; growing public acceptance of formal treatment for drug abuse and alcoholism; and some lessening of the stigma attached to receiving mental health care.

While most openings for psychiatric aides are likely to occur in hospitals, additional opportunities will be available in such settings as community mental health centers, residential treatment facilities, halfway houses, and outpatient psychiatric clinics.

In both occupations, replacement needs will constitute the major source of openings. Turnover is high, a reflection of relatively low skill requirements and low pay.

Earnings

Median annual earnings of nursing aides who worked full time in 1984 were about $10,000. The middle 50 percent earned between $8,000 and $13,000. The lowest 10 percent earned about $7,000 or less. The top 10 percent earned $17,000 or more.

In 1985, the Veterans Administration paid inexperienced nursing aides who were high school graduates annual salaries of $10,501. Nursing aides with a year of experience received $11,458, while those with 2 years received $12,862. The average salary of nursing aides employed by the Federal Government was about $15,200 a year in 1984.

Nursing aides in hospitals had median average salaries ranging from $10,600 to $12,800 a year in 1985, depending on the size of the hospital, according to the Executive Compensation Service. Orderlies' median average salaries ranged from $10,500 to $13,100.

Nursing homes paid certified nursing aides median annual salaries of $8,900 and noncertified nursing aides, about $8,300 in 1984, according to a survey by the Hospital Compensation Service.

Nursing aides in home health agencies had average salaries of about $8,900 a year in 1983, according to a Home Care Agency Survey conducted by the Select Committee on Aging of the U.S. House of Representatives.

Attendants in hospitals and similar institutions generally receive at least 1 week's paid vacation after 1 year of service. Paid holidays and sick leave, hospital and medical benefits, extra pay for late-shift work, and pension plans also are available to many hospital employees.

Related Occupations

Nursing aides and psychiatric aides help with the care and treatment of people who are sick, disabled, or infirm. They may move and assemble heavy equipment and perform housekeeping chores. Workers with similar duties include homemaker-home health aides, mental health technicians, childcare attendants, companions, occupational therapy aides, physical therapy aides, caretakers, and central supply workers.

Sources of Additional Information

For information on nursing careers in hospitals, contact:

American Hospital Association, Division of Nursing, 840 North Lake Shore Dr., Chicago, Ill. 60611.

For a copy of *Health Careers in Long-Term Care*, write:

American Health Care Association, 1200 15th St. NW., Washington, D.C. 20005.

Information about employment also may be obtained from local hospitals and nursing homes.

Cleaning Service Occupations

Hotels, hospitals, apartment and office buildings, schools, factories, and other structures need to be kept clean and in good condition. This work is done by people in cleaning service occupations. They clean, replenish supplies, and do routine maintenance.

Workers who have limited skills or little education can often find jobs in this field. Skills usually are learned on the job, but other training sometimes is available. Janitors, for example, may attend training programs offered by unions and government agencies. Maids and housekeepers may take home study or classroom courses in housekeeping procedures offered by their employer. Workers who do their jobs well and show they can handle responsibility may advance to supervisor.

Cleaning service workers must be courteous, tactful, and neat if their job requires contact with the public. They should be able to follow instructions and work well on their own. Some of these workers perform repetitive and tiring tasks such as scrubbing and waxing floors or making up beds. They must be able to tolerate the boredom of the job.

Starting pay for most cleaning and building service workers is relatively low.

Employment of these workers should increase as additonal hotels, office buildings, and other structures that require cleaning and maintenance are built. Job turnover is high in these occupations. Thus, besides jobs created by increased demand for cleaning services, many job openings will occur each year as workers transfer to other occupations or leave the labor force.

Janitors and Cleaners

(D.O.T. 323.687; 358.687-010; 381.687 except -010; 382.664-010; 389.667-010, .683-010, .687-014; 739.687-198; 891.687-010 and -018; and 952.687-010)

Nature of the Work

Janitors or cleaners—also called building custodians—keep office buildings, hospitals, stores, apartment houses, and other types of buildings clean and in good condition. Some janitors only do cleaning; others have a wide range of duties. They may fix leaky faucets, empty trash cans, do painting and carpentry, replenish bathroom supplies, mow lawns, and see that heating and air-conditioning equipment works properly. On a typical day, janitors may wet- or dry-mop floors, vacuum carpets, dust furniture, make minor repairs, and exterminate insects and rodents.

Janitors and cleaners use different equipment, tools, and cleaning materials. For one job they may need a mop and bucket; for another, an electric polishing machine and a special cleaning solution. Improved chemical cleaners and power equipment have made many tasks easier and less time consuming, but janitors must know how to use them properly to avoid harming floors and fixtures.

Working Conditions

Since most office buildings are cleaned while they are empty, many cleaners work evening hours. Some, however, such as school custodians, work in the daytime. When there is a need for 24-hour maintenance, janitors may be assigned to shifts.

Janitors and cleaners usually work inside heated, well-lighted buildings. However, sometimes they work outdoors sweeping walkways, mowing lawns, or shoveling snow. Working with machines can be noisy, and some tasks, such as cleaning bathrooms and trash rooms, can be dirty and unpleasant. Janitors may suffer minor cuts, bruises, and burns from machines, handtools, and chemicals.

Janitors and cleaners spend most of their time on their feet, sometimes lifting or pushing heavy furniture or equipment. Many tasks, such as dusting or sweeping, require constant bending, stooping, and stretching.

Employment

Janitors and cleaners held 2.9 million jobs in 1984. One-third worked part time (less than 35 hours a week).

Custodians worked in every type of establishment. About 1 in 5 worked in a school, including colleges and universities. One in 10 worked in a hotel and 1 in 14 in a hospital. One in 6 worked for a firm supplying building maintenance services on a contract basis. Others were employed by restaurants, operators of apartment buildings; office buildings, and other types of real estate, churches and other religious organizations, manufacturing firms, and government agencies.

Although cleaning jobs can be found in all cities and towns, most are located in highly populated areas where there are many office buildings, stores, and apartment houses.

Training, Other Qualifications, and Advancement

No special education is required for most cleaning jobs, but the beginner should know simple arithmetic and be able to follow instructions. High school shop courses are helpful for minor plumbing or carpentry work.

Most janitors and cleaners learn their skills on the job. Usually, beginners work with an experienced cleaner doing routine cleaning. They are given more complicated work as they gain experience.

In some cities, programs run by unions, government agencies, or employers teach janitorial skills. Students learn how to clean buildings thoroughly and efficiently, the correct way to clean different surfaces, and how to operate and maintain machines used on the job, such as wet and dry vacuums, buffers, and polishers. Instruction in minor electrical, plumbing, and other repairs may also be given. As part of their training, students learn to plan their work, to follow safety and health regulations, to deal with people in the buildings they clean, and to work without supervision.

Janitors and cleaners usually find work by answering newspaper advertisements or applying directly to a company where they would like to work or to a building maintenance

One-third of janitors and cleaners work part time.

service. They also get jobs through State employment offices. Cleaning jobs in the government are obtained by applying to the civil service personnel headquarters.

Advancement opportunities for janitorial workers usually are limited because, in many buildings, the janitor is the only maintenance worker. Where there is a large maintenance staff, however, janitors can be promoted to supervisory jobs. A high school diploma improves the chances for advancement. Some janitors go into the maintenance business for themselves.

Job Outlook

Employment of building janitors and cleaners is expected to grow about as fast as the average for all occupations through the mid-1990's as the number of office buildings, factories, hospitals, apartment houses, schools, and other buildings increases. Employment will grow much faster than average in firms supplying building maintenance services as more employers contract out their cleaning work. The need to replace workers who transfer to other occupations or leave the labor force will create most job openings. This large occupation is easy to enter since there are few requirements for formal education and training and part-time jobs are plentiful.

In the short run, new technology is expected to have little effect on employment of janitors and cleaners. Robots now under development are limited to performing a single cleaning task like vacuuming and then only in large, uncluttered areas like airports. Robots with multiple cleaning functions will probably not become available until after 1995. Since they are expected to be expensive, it may not be practical to replace low-paid cleaning personnel with these machines. Even if these robots become affordable, they could not be used in many places, particularly cluttered areas.

Earnings

Janitors and cleaners who usually worked full time averaged $225 a week in 1984; the middle 50 percent earned between $175 and $305. Ten percent earned less than $135, 10 percent more than $387.

In 1984, average straight-time earnings of janitors and cleaners in metropolitan areas were $5.70 an hour, which is less than three-fourths as much as the average earnings for all nonsupervisory workers in private industry, except farming. The average for janitors in manufacturing industries was $8.35 and for non-manufacturing industries, $5.07. Earnings, however, vary by industry and area of the country. Workers in large cities of the Northeast, North Central, and Western regions usually earn the highest wages. Many nonunion, part-time workers earned the minimum wage, $3.35 an hour.

Most building service workers receive paid holidays and vacations and health insurance.

Related Occupations

Janitors are not the only workers who clean and maintain buildings. Some workers who have similar skills and job duties are trash collectors, floor waxers, street sweepers, window cleaners, private household workers, gardeners, boiler tenders, pest controllers, elevator operators, and general maintenance repairers.

Sources of Additional Information

Information about janitorial jobs may be obtained from a local State employment service office or from:

Service Employees International Union, 2020 K St. NW., Washington, D.C. 20006.

Personal Service Occupations

Personal service workers perform a variety of tasks for other people. They cut hair, make airplane passengers comfortable, conduct tours, take theater tickets, distribute equipment and collect fees at amusement and recreation facilities, shine shoes, care for costumes of entertainers, check coats, carry baggage, care for children, and do household chores for people who cannot manage for themselves. Because the work involves doing things for others, the ability to deal effectively with all kinds of people is a "must." A pleasant personality, tact, and a sense of humor are assets.

Personal service workers held about 1.6 million jobs in 1984. *Cosmetologists* and *childcare workers* (who supervise children in nursery schools and play groups) accounted for over two-thirds of all personal service jobs.

Some personal service jobs require formal training that lasts from several weeks to a year or so. Flight attendants go to training schools run by the airlines themselves; barbers and cosmetologists generally learn their trade in public or private vocational schools. Most other personal service workers, however, acquire their skills on the job. A high school diploma is necessary for some of these jobs. All employers stress the importance of such personal characteristics as poise, good grooming, and a pleasant disposition. Physical stamina is important, for much of the work involves being on one's feet for long periods of time.

For many young people, a personal service job serves as entry to the work force. The abundance of part-time job opportunities attracts persons of all ages who want to combine a job with family, school, or other responsibilities.

Starting pay in many of these jobs is at or only slightly above the minimum wage. Often, however, workers also receive tips that add substantially to their income. Some workers—cosmetologists in particular—are employed on a commission basis. Many of these workers eventually open their own businesses.

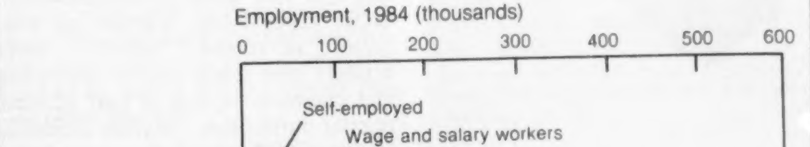
Indeed, the large proportion of people who work for themselves is a distinguishing characteristic of the personal service occupations. In 1984, over two-fifths of these workers were self-employed, compared to less than one-tenth of all workers. Running one's own business is especially common among barbers, cosmetologists, and childcare workers (see accompanying chart). People who aspire to work for themselves must not only be good enough at what they do to maintain a steady flow of customers, they also must have the drive and business acumen to handle finances, suppliers, and staff.

Most job openings for personal service workers will result from the need to replace those who transfer to other occupations, assume full-time household duties, or stop working for other reasons. Replacement needs are substantial because turnover is high—a characteristic of occupations that require a relatively limited investment in training. There are exceptions, however. Barbers, for example, tend to have a relatively strong attachment to their occupation.

Employment of personal service workers is expected to increase about as fast as the average for all occupations through the mid-1990's. However, projected employment growth varies by occupation. For example, employment of social welfare service aides, a category that includes geriatric aides and homemaker-home health aides, should grow faster than average in response to increased demand for community and in-home services for the elderly. On the other hand, employment of childcare workers is expected to grow more slowly than average in response to slow growth in the number of preschool-age children and in the labor force participation of mothers of these children.

For more detailed information on barbers, childcare workers, cosmetologists, and flight attendants, see the *Handbook* statements that follow.

Many personal service workers are self-employed.



SOURCE: Bureau of Labor Statistics

Barbers

(D.O.T. 330)

Nature of the Work

Barbers cut, trim, shampoo, and style hair. Many people still go to a barber for just a haircut, but more and more seek services such as hairstyling and permanents. Barbers trained in these areas are called "hairstylists" and work in styling salons, "unisex" salons, and some barbershops. They cut and style hair to suit each customer and may color or straighten hair and fit hairpieces. Most barbers offer hair and scalp treatments, shaves, and facial massages.

By tradition, most customers are men. However, a growing number of barbers cut and style women's hair. They usually work in unisex salons—shops that have male and female customers. Some States require a cosmetologist's license as well as a barber's license, however, to permanent wave or color women's hair. (See the *Handbook* statement on cosmetologists and related workers.)

As part of their responsibilities, barbers keep their scissors, combs, and other instruments sterilized and in good condition. They clean their work areas and may sweep the shop as well. Some sell lotions, tonics, and other cosmetic supplies. Those who own or manage a shop order supplies, pay bills, keep records, and hire employees.

Working Conditions

Barbers usually work in clean, pleasant surroundings, with good lighting and ventilation. Good health and stamina are important because barbers must stand on their feet a great deal and work with both hands at shoulder level—a position that can be tiring.

Most barbers work more than 40 hours a week, and a workweek of over 50 hours is not uncommon. Although weekends and lunch hours are generally very busy, a barber may have some time off during slack periods. To assure an even workload, some barbers ask customers to make appointments.

Employment

Barbers held about 94,000 jobs in 1984. Most worked in barbershops, some worked in beauty shops and unisex salons, and a few worked in department stores, hotels, hospitals, and prisons. About 2 out of every 3 barbers operate their own businesses.

Almost all cities and towns have barbershops, but employment is concentrated in the most populous cities and States. Hairstylists usually work in large cities, where the greatest demand for their services exists.

Training, Other Qualifications, and Advancement

Nearly all States require barbers to be licensed. The qualifications necessary to get a license vary from one State to another, however. Generally a person must be a graduate of a State-approved barber school and be at least 16 years old (18 in some States). In addition, education requirements vary from State to State—some require graduation from high school while others have no requirement at all.

About 2 out of every 3 barbers operate their own businesses.

Many States require a beginner to take an examination for an apprentice license and serve 1 or 2 years as an apprentice before taking the examination required for a license as a registered barber. In the examinations, the applicant usually is required to pass a written test and demonstrate an ability to perform the basic services. Fees for these examinations range from $15 to $85.

Some States have reciprocity agreements that allow licensed barbers to practice in a different State without additional formal training. However, some States do not recognize training, apprenticeship work, or licenses obtained in another State; consequently, persons who wish to become barbers should review the laws of the State in which they want to work before entering a barber school or seeking employment.

Barber training is offered in about 400 schools; 9 out of 10 barber schools are private. Some State-approved schools train both barbers and cosmetologists. Some public high schools offer barbering in their vocational programs. Barber school programs usually last 9 to 12 months. Students buy their own tools, which cost about $400. They study the basic services—haircutting, shaving, facial massaging, and hair and scalp treatments—and, under supervision, practice on customers in school "clinics." Most schools now teach unisex hairstyling and chemical styling as part of their regular curriculum. Besides attending lectures on barber services and the use and care of instruments, students take courses in sanitation and hygiene, and learn how to recognize certain skin conditions. Instruction also is given in selling and general business practices. Advanced courses are available in some localities for barbers who wish to update their skills or specialize in hairstyling, coloring, and the sale and service of hairpieces.

Dealing with customers requires patience and a better than average disposition. In addition, good eye-hand coordination is required. Barbers also should have sound judgment about what hairstyle is most flattering.

Beginners usually get their first jobs through the barber school they attended.

Some experienced barbers advance by becoming managers of large shops or by opening their own shops. A few may teach at barber schools. Barbers who go into business for themselves must have the capital to buy or rent a shop and install equipment. New equipment for a one-chair shop averaged about $5,000 in 1984. Some shopowners buy used equipment and fixtures at reduced prices, however.

Job Outlook

Over the last 15 years, the demand for barbers has decreased. However, employment of barbers has leveled off recently and is expected to increase more slowly than the average for all occupations through the mid-1990's due to population growth and the increasing popularity of hairstyling.

Barbers have a relatively strong attachment to their occupation—unlike most workers in occupations that require less than a year of formal training. Nevertheless, most job openings will result from the need to replace experienced barbers who retire or stop working for other reasons. Most barbers remain in the occupation until they retire—perhaps because most barbers are self-employed.

The shift in consumer preferences from regular haircuts to more personalized and intensive services also has greatly affected the occupation. Barbers who specialize in hairstyling have been much more successful than those who offer conventional services. This trend is expected to continue, and employment opportunities should be better for hairstylists than for other barbers.

Earnings

Barbers receive income from commissions or wages and tips. Most barbers who are not shopowners normally receive 60 to 70 percent of the money they take in; a few are paid straight salaries.

Most barbers and hairstylists in their first few years of employment earned between $14,000 and $18,000 a year in 1984, according to limited information available. Many experienced barbers and hairstylists earned over $20,000 a year. Hairstylists usually earn more than conventional barbers because the services they provide are more personalized, complex, and therefore more expensive.

Earnings depend on the size and location of the shop, customers' tipping habits, competition from other barbershops, and the barber's ability to attract and hold regular customers. Some barbers receive 1- or 2-week paid vacations, insurance, and medical benefits.

The principal union that organizes barbers—both employees and shopowners—is the United Food and Commercial Workers International Union. The principal association that represents and organizes shopowners, managers, and employees is the Associated Master Barbers and Beauticians of America.

Related Occupations

Other workers whose main activity consists of improving a patron's personal appearance include cosmetologists, electrologists, makeup artists, and estheticians.

Sources of Additional Information

Lists of barber schools, by State, are available from:

National Association of Barber Schools, Inc., 304 South 11th St., Lincoln, Nebr. 68508.

National Association of Trade and Technical Schools, 2251 Wisconsin Ave. NW., Washington, D.C. 20007.

Every State maintains information on State licensing requirements and approved barber schools. For details, contact the State board of barber examiners or the equivalent authority at your State capital.

Additional information on this occupation is available from:

National Barber Career Center, 3839 White Plains Rd., Bronx, N.Y. 10467.

Associated Master Barbers and Beauticians of America, 219 Greenwich Rd., P.O. Box 220782, Charlotte, N.C. 28222.

Childcare Workers

(D.O.T. 355.674-010; and 359.677-010, -018, -026)

Nature of the Work

Childcare workers look after young children when parents are at work or cannot be with their children for other reasons. They do many of the things parents do for their children. Those caring for infants and toddlers follow a routine of basic care—feeding, bathing, diapering, playing with, and comforting. Those working with older preschool children, in addition to taking care of their basic needs, plan and carry out programs to stimulate the children's physical, emotional, and social growth.

Childcare workers' duties depend on the setting in which they work. Childcare workers in a large daycare center are in charge of groups of children under the supervision of a director who also handles administrative and program development responsibilities. Self-employed childcare workers taking care of a small number of children in their own homes, often referred to as family daycare, have sole responsibility for those children. In addition to caring for children, self-employed childcare workers are responsible for a safe and clean environment, good nutrition, games, and other activities. Many also handle administrative duties such as obtaining and renewing a license, hiring help, purchasing supplies, keeping records, mailing out bills, and recruiting children.

Regardless of the children's age or the setting, childcare workers make sure that the childrens' basic physical, psychological, social, and educational needs are met. Typical duties may include greeting children as they arrive, helping them remove outer garments, and teaching them how to dress and undress. They may organize and direct indoor and outdoor games and activities or take them on field trips. They select activities which provide self-expression and development through arts and crafts, music, and language. These may include painting and drawing, working with clay and wood, singing, and story reading and telling. They also organize play activities which not only provide physical exercise but teach the children how to get along with each other.

Childcare workers are also concerned with the children's health and nutrition. They serve nutritious meals and snacks and use these as an opportunity to teach the children good eating habits and responsibility for cleaning up after themselves. They also see to it that the children have proper rest periods. They spot children who may be getting sick or showing signs of emotional or developmental problems and bring these to the parents' attention.

Working Conditions

Working conditions vary. Childcare facilities may range from a single

Childcare workers serve nutritious meals and snacks and demonstrate good eating habits.

poorly furnished room to a large, beautifully equipped building. Some facilities accommodate a few children, others a hundred or more. Childcare centers may be in private homes, churches, and on premises of universities, businesses, or other organizations that provide care for employees' children. Others are in new or remodeled buildings used exclusively for childcare.

Childcare centers are open year round. Many are open 12 hours a day. Full-time staff workers usually have 8-hour shifts. However, many work part time or have staggered hours. Self-employed childcare workers with young children can earn money without having to leave them. They have great flexibility in their hours of work and in daily routine. Since they work in their own home, they also are able to handle some housekeeping responsibilities while looking after children.

Childcare workers spend much of their time standing, walking, bending, stooping, and lifting. They must be constantly alert, anticipate and prevent trouble, deal with disruptive children, and provide fair but firm discipline. This can be physically and emotionally taxing. The work is demanding and sometimes hectic and requires a great deal of physical stamina. Rewards, on the other hand, come from seeing young children blossom and grow under their care.

Employment

Childcare workers held 572,000 jobs in 1984. Many work part time. Almost two-thirds of childcare workers are self-employed; most take care of children in their own homes. More than half of the salaried childcare workers work in independent childcare centers and residential childcare institutions. About 15 percent work in childcare centers affiliated with churches and synagogues and in social or welfare agencies. Some are in State and local government agencies, hospitals, and employer-sponsored daycare centers.

Training, Other Qualifications, and Advancement

Entry level positions for childcare workers require little or no experience, for the most part. Although there are no specific educational requirements, employers prefer individuals with a high school diploma. Some employers provide on-the-job training by an experienced worker.

High school students who plan to work with small children should take courses in psychology, sociology, home economics, nutrition, and family living. Courses in art, music, drama, and physical education also provide good preparation. Volunteer or paid babysitting is helpful.

Formal training or certification is recommended for individuals who wish to advance. Many 2-year and 4-year colleges offer certificate and associate degree programs in childcare and guidance. Subjects include childhood development, child health care, child psychology, and play and educational activities.

The Child Development Associate (CDA) credential program offers an alternative way toward certification. It stresses on-the-job performance and experience. The program is open to anyone 18 years of age or older. A team of childcare professionals conducts the assessment and decides whether the individual qualifies for the CDA credential. The CDA assessment process may take several months or longer.

Childcare workers should like working with small children and should be kind and patient. They should be in excellent health since the work requires much energy and physical stamina. Skills in music, art, drama and storytelling are also important. Those who work for themselves must have good business sense and management abilities. As childcare workers gain experience, they may advance to supervisory or administrative positions in large childcare centers. Often, however, these positions require additional training. Some set up their own childcare business.

Job Outlook

Job openings for childcare workers are expected to be plentiful through the mid-1990's. Most openings will arise from the need to replace the high proportion of childcare workers who leave this very large occupation every year. There is considerable movement into and out of the occupation due to the ease of setting up childcare in one's home, limited education and training requirements, the abundance of part-time jobs, and the low pay.

Employment of childcare workers is expected to grow more slowly than the average for all occupations through the mid-1990's, primarily because of an anticipated slow growth in the number of preschool age children with working mothers. Employment of childcare workers is sensitive to ups and downs in the economy. During recessions, the number of parents who cannot find jobs increases and parents who are not employed are less likely to need or afford childcare.

Earnings

In 1984, median annual earnings of full-time childcare workers were $9,200. The middle 50 percent earned between $6,800 and $12,300; the top 10 percent earned at least $15,600.

Wages of childcare workers vary depending on the part of the country and the type of childcare center in which they work. Wages are highest in the West and lowest in the Southeast. Wages tend to be higher in large centers and lower in church-affiliated centers. Many entry level childcare workers receive only the minimum wage of $3.35 an hour. Earnings of self-employed childcare workers vary even more than those of wage and salary workers, depending on the number and ages of the children and the geographic area.

Related Occupations

Childcare work requires a wide variety of aptitudes and skills, including patience, creativity, an ability to motivate, teach, and influence others, and, in some cases, leadership and organizational and administrative abilities. Other occupations that require these aptitudes include teacher aide, children's tutor, foster parent, recreational therapist, social worker, and early childhood program director.

Sources of Additional Information

For general information about childcare workers, contact:

National Association for Childcare Management, 1255 23rd St. NW., Washington, D.C. 20037.

Childcare Employee Project, P.O. Box 5603, Berkeley, Calif. 94705.

For information on childcare center accreditation standards and program development and resources, contact:

National Association for the Education of Young Children, 1834 Connecticut Ave., NW., Washington, D.C. 20009.

For eligibility requirements and a description of the Child Development Associate Credential (CDA), write to:

CDA National Credentialing Program, 1341 G St., NW., Room 802, Washington, D.C. 20005.

Cosmetologists and Related Workers

(D.O.T. 331; 332; 333; 339.361, .371)

Nature of the Work

Hair has been a center of attention since people first began to care about their appearance. Throughout history, a great deal of effort has gone into acquiring a fashionable hairstyle or a perfectly trimmed beard. Although styles change from year to year, the cosmetologist's task remains the same—to help people look attractive.

Cosmetologists, also called *beauty operators*, *hairstylists*, or *beauticians*, shampoo, cut, and style hair, and advise patrons on how to care for their hair. Frequently they straighten or permanent wave a patron's hair to keep the style in shape. Cosmetologists may also lighten or darken the color of the hair. Cosmetologists may give manicures and scalp and facial treatments; provide makeup analysis for women; and clean and style wigs and hairpieces. Related workers include *makeup artists*, who apply makeup to performers; *electrologists*, who remove hair from skin by electrolysis; and *estheticians*, who cleanse and beautify the skin.

Most cosmetologists make appointments and keep records of hair color and permanent wave formulas used by their regular patrons. They also keep their work area clean and sanitize their hairdressing implements. Those who operate their own salons also have managerial duties which include hiring and supervising workers, keeping records, and ordering supplies.

Working Conditions

Cosmetologists generally work in clean, pleasant surroundings, with good lighting and comfortable temperatures. Their work can be arduous and physically demanding because they must be on their feet for hours at a time and work with their hands at shoulder level. Many full-time cosmetologists work more than 40 hours a week, including evenings and weekends, when beauty salons are busiest.

Employment

Cosmetologists held about 524,000 jobs in 1984. The overwhelming majority of cosmetologists were hairstylists; other specialists included manicurists and shampooers. Most worked in beauty salons, some worked in "unisex" salons, barber shops, or department stores, and a few were employed by hospitals and hotels. About one-half of all cosmetologists operate their own businesses.

About two-fifths of all cosmetologists work part time. The abundance of part-time jobs attracts many persons who want to combine a job with family, school, or other responsibilities.

All cities and towns have beauty salons, but employment is concentrated in the most populous cities and States. Those cosmetologists who set fashion trends with their hairstyles usually work in New York City, Los Angeles, and other centers of fashion and the performing arts.

Training, Other Qualifications, and Advancement

Although all States require cosmetologists to be licensed, the qualifications necessary to obtain a license vary. Generally, a person must have graduated from a State-licensed cosmetology school, pass a physical examination, and be at least 16 years old. In addition, education requirements vary from State to State—some require graduation from high school while others have no requirement at all. In a few States, completion of an apprentice training program can substitute for graduation from a cosmetology school, but very few cosmetologists learn their skills in this way.

Cosmetology instruction is offered in both public and private vocational schools, in either daytime or evening classes. A daytime course usually takes 6 months to 1 year to complete;

Cosmetologists must keep abreast of changing hairstyles.

an evening course takes longer. Many public school programs include the academic subjects needed for a high school diploma and last 2 to 3 years. An apprenticeship program usually lasts 1 or 2 years.

Both public and private programs include classroom study, demonstrations, and practical work. Most schools provide students with the necessary hairdressing implements, such as manicure implements, combs, scissors, razors, and hair rollers, and include their cost in the tuition fee. Sometimes students must purchase their own. A good set of implements costs between $85 and $130. Beginning students work on mannequins or on each other. Once they have gained some experience, students practice on patrons in school "clinics." Most schools now teach unisex hairstyling as part of their regular curriculums. (See the *Handbook* statement on barbers.)

After graduating from a cosmetology program, students take the State licensing examination. The examination consists of a written test and a practical test in which applicants demonstrate their ability to perform the required services. In some States, an oral examination is included, and the applicant is asked to explain the procedures he or she is following while taking the practical test. In some States, a separate examination is given for persons who want only a manicurist's license or a skin care license. Some States have reciprocity agreements that allow a cosmetologist licensed in one State to work in another without reexamination.

For many people, cosmetology serves as an entry point to the world of work. The field is also characterized by a pattern of movement from family responsibilities into the labor force—when employment and earnings opportunities are attractive enough—and back to the home again. In fact, most entrants to this occupation come from outside the labor force; relatively few transfer from other occupations.

Persons who want to become cosmetologists must have finger dexterity and a sense of form and artistry. They should enjoy dealing with the public and be willing and able to follow patrons' instructions. Because hairstyles are constantly changing, cosmetologists must keep abreast of the latest fashions and beauty techniques. Business skills are important for those who plan to operate their own salons.

Many schools help their students find jobs. During their first months on the job, new cosmetologists are given relatively simple tasks, such as giving manicures or shampoos, or are assigned to perform the simpler hairstyling patterns. Once they have demonstrated their skills, they are gradually permitted to perform the more complicated tasks such as hair coloring and permanent waving.

Advancement usually is in the form of higher earnings as cosmetologists gain experience and build a steady clientele, but many manage large salons or open their own after several years of experience. Some teach in cosmetology schools or use their knowledge and skill to demonstrate cosmetics in department stores. Others become sales representatives for cosmetics firms, or open businesses as beauty or fashion consultants. Some cosmetologists work as examiners for State cosmetology boards.

Job Outlook

Job openings for cosmetologists are expected to be plentiful through the mid-1990's. Most openings will result from the need to replace the large number of workers who leave the occupation each year—primarily to devote full time to household responsibilities. Employment of cosmetologists is expected to grow faster than the average for all occupations through the mid-1990's in response to population growth, particularly among middle-aged persons, who are the primary users of cosmetology services, and the rising number of working women. Hairstyling for men also contributes to the demand for cosmetologists because many men go to unisex shops or beauty salons for styling services. Opportunities for part-time work will continue to be very good.

Most people regard spending on grooming care as discretionary. During hard economic times, they tend to visit cosmetologists less frequently, which reduces cosmetologists' earnings. Rarely, however, are cosmetologists laid off solely because of economic downturns.

Earnings

Cosmetologists receive income from commissions or wages, and from tips. Those who are not salon owners receive a percentage of the money they take in, about 50 percent; a few are paid straight salaries.

Weekly earnings (including tips) of beginning cosmetologists generally ranged between $120 and $160 in 1984, according to limited information available. Experienced cosmetologists usually earned between $250 and $400 a week.

Earnings also depend on the size and location of the salon, patrons' tipping habits, competition from other beauty salons, and the individual cosmetologist's ability to attract and hold regular patrons.

Large salons and department stores offer group life and health insurance and other benefit plans. Nearly all employers provide annual paid vacations of at least 1 week after a year's service.

The principal union which organizes cosmetologists—both employees and salon owners—is the United Food and Commercial Workers International Union. The principal trade association which represents and organizes salon owners, managers, and employees is the National Hairdressers and Cosmetologists Association, Inc. Other organizations include the Associated Master Barbers and Beauticians of America; the National Association of Cosmetology Schools, Inc., which represents school owners and teachers; and the National Beauty Culturists' League, representing black cosmetologists, teachers, managers, and salon owners.

Related Occupations

Other workers whose main activity consists of helping patrons improve their personal appearance include barbers, makeup artists, and health club managers.

Sources of Additional Information

A list of licensed training schools and licensing requirements can be obtained from State boards of cosmetology or from:

National Accrediting Commission of Cosmetology Arts and Sciences, 1990 M St. NW., Suite 650, Washington, D.C. 20036.

Additional information about careers in cosmetology and State licensing requirements is available from:

National Beauty Career Center, 3839 White Plains Rd., Bronx, N.Y. 10467.

National Hairdressers and Cosmetologists Association, 3510 Olive St., St. Louis, Mo. 63103.

For general information about the occupation, contact:

Associated Master Barbers and Beauticians of America, 219 Greenwich Rd., P.O. Box 220782, Charlotte, N.C. 28222.

National Association of Cosmetology Schools, 1990 M St. NW., Suite 660, Washington, D.C. 20036.

Flight Attendants

(D.O.T. 352.367-010)

Nature of the Work

Flight attendants are aboard almost all passenger planes to look after the passengers' flight safety and comfort.

At least 1 hour before each flight, attendants are briefed by the captain on expected weather conditions, special passenger problems, and other matters. They see that the passenger cabin is in order, that supplies of food, beverages, blankets, and reading material are adequate, and that first aid kits and other emergency equipment are aboard and in working order. As passengers come aboard, attendants greet them, check their tickets, and assist them in storing coats and carry-on luggage.

Before the plane takes off, attendants instruct passengers in the use of emergency equipment and check to see that all passengers have their seat belts fastened and seat backs forward. In the air, they answer questions about the flight, distribute magazines and pillows, and help care for small children and elderly and handicapped persons. They may administer first aid to passengers who become ill. Attendants also serve cocktails and other refreshments and, on many flights, heat and distribute precooked meals. After the plane has landed, the flight attendant assists passengers as they leave the plane. They then prepare reports on medications given to passengers, lost and found articles, and cabin equipment conditions. Some flight attendants straighten up the plane's cabin.

Assisting passengers in the rare event of an emergency is one of the most important functions of attendants. This may range from reassuring passengers during occasional encounters with strong turbulence to opening emergency exits and inflating evacuation chutes following an emergency landing.

Senior flight attendants are working supervisors aboard planes—directing the work of junior attendants while performing some of the same duties.

Working Conditions

Since airlines operate around the clock year round, attendants may work at night and on holidays and weekends. They usually fly 75 to 85 hours a month. In addition, they generally spend about 75 to 85 hours a month on the ground preparing planes for flight, debriefing following completed flights, and waiting for planes that arrive late. Because of variations in scheduling and limitations on flying time, many attendants have 11 or 12 days or more off each month. Attendants may be away from their home bases at least one-third of the time. During this period, the airlines provide hotel accommodations and an allowance for meal expenses.

Flight attendants have the opportunity to meet interesting people and see new places. The combination of free time and discount air fares provides substantial opportunity for travel. However, the work can be strenuous and trying. Short flights require speedy service if meals are served. A rough flight can make serving drinks and meals difficult. Attendants stand during much of the flight and must remain pleasant and efficient regardless of how tired they are or how demanding passengers may be.

Employment

Flight attendants held 64,000 jobs in 1984. Commercial airlines employed the vast majority of all flight attendants, most of whom were stationed in major cities at the airlines' home bases. A small number of flight attendants worked for large companies that operate their own aircraft for business purposes.

Training, Other Qualifications, and Advancement

The airlines like to hire poised, tactful, and resourceful people who can deal comfortably with strangers. Applicants usually must be at least 19-21 years old, but some airlines have higher minimum age requirements. Flight attendants must have excellent health, good vision, and the ability to speak clearly.

Applicants must be high school graduates. Those having several years of college or experience in dealing with the public are preferred. Flight attendants for international airlines generally must speak an appropriate foreign language fluently.

Most large airlines require that newly hired flight attendants complete 4 to 6 weeks of intensive training in their own schools. The airlines that do not operate schools generally send new employees to the school of another airline. Transportation to the training centers and an allowance for board, room, and school supplies may be provided. Trainees learn emergency

Attendants assist passengers in storing coats and carry-on luggage.

procedures such as evacuating an airplane, operating an oxygen system, and giving first aid. Attendants also are taught flight regulations and duties, and company operations and policies. Trainees receive instruction on personal grooming and weight control. Trainees for the international routes get additional courses in passport and customs regulations. Towards the end of their training, students go on practice flights. Attendants must receive 12 hours of training in emergency procedures and passenger relations annually.

After completing initial training, flight attendants are assigned to one of their airline's bases. New attendants are placed in "reserve status" and either are called on to staff extra flights or fill in for attendants who are sick or on vacation. Reserve attendants on duty must be available on short notice. Attendants usually remain on reserve for at least 1 year; at some cities, it may take as long as 5 years to advance from reserve status. Advancement takes longer today than in the past because experienced attendants are remaining in this career for more years than they used to. Attendants who no longer are on reserve bid for regular assignments. Because these assignments are based on seniority, usually only the most experienced attendants get their choice of base and flights.

Some attendants advance to flight service instructor, customer service director, recruiting representative, or various other administrative positions.

Job Outlook

Competition for jobs as flight attendants is expected to remain very keen through the mid-1990's because the number of applicants is expected to greatly exceed the number of job openings. The glamour of the airline industry and opportunity to travel attract many applicants. Those with at least 2 years of college and experience in dealing with the public have the best chance of being hired.

Employment of flight attendants is expected to grow faster than the average for all occupations through the mid-1990's. Growth in population and income is expected to increase the number of airline passengers. Airlines usually enlarge their capacity by increasing the number and size of planes in operation. Since Federal Aviation Administration safety rules require one attendant for every 50 seats, more flight attendants will be needed.

As more career-minded people enter this occupation, job turnover will decline. Nevertheless, most job openings are expected from the need to replace attendants who stop working or transfer to other occupations.

Employment of flight attendants is sensitive to cyclical swings in the economy. During recessions, when the demand for air travel declines, many flight attendants are put on part-time status or are laid off. Until demand increases, few new attendants are hired.

Earnings

Beginning flight attendants averaged about $13,000 a year in 1984. Annual earnings of experienced flight attendants averaged about $23,000 in 1984. Flight attendants receive extra compensation for overtime and for night and international flights. In addition, flight attendants and their immediate families are entitled to reduced fares on their own and most other airlines.

Many flight attendants belong to the Association of Flight Attendants, AFL-CIO. Others are members of the Transport Workers Union of America or several other unions.

Flight attendants are required to buy uniforms and wear them while on duty. Uniform replacement items are usually paid for by the company. The uniform is made to measure and is designed to look like a coordinated wardrobe. The airlines generally provide a small allowance to cover cleaning and upkeep of the uniforms.

Related Occupations

Other jobs that involve helping people and require the ability to be pleasant even under trying circumstances include tour guide, gate agent, host or hostess, waiter or waitress, and camp counselor.

Sources of Additional Information

For further information, request *Flight Attendants*, publication GA-300-127 (enclose a self-addressed mailing label), from:

U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

Information about job opportunities may be obtained from:

Future Aviation Professionals of America, 4291 J. Memorial Dr., Decatur, Ga. 30032. (This organization may be called toll free at 800-Jet-Jobs.)

Information about job opportunities in a particular airline and the qualifications required may be obtained by writing to the personnel manager of the company. Addresses of companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

Agricultural, Forestry, and Fishing Occupations

Agricultural, forestry, and fishing workers are involved in the gathering, development, production, and distribution of basic products for food, clothing, shelter, and industrial use. Agricultural workers raise crops and livestock that provide food as well as material for clothing. Forestry workers harvest trees that provide lumber for housing and other buildings as well as material for a variety of paper products. Fishing workers gather sea and lake life that provides food, fertilizer, and other products. Agricultural, forestry, and fishing workers also provide services associated with agricultural production, game farms, fisheries, and wild life conservation.

Agricultural workers include farm operators and managers, who are concerned with maximizing farm production and profits through skillful management of farm land, labor, and capital. They oversee workers such as farm worker supervisors; farm machinery operators; and irrigation, livestock, field crop, nursery, and fish hatchery workers. Nonfarm agricultural workers include groundskeepers and gardeners; animal caretakers; and agricultural product graders, sorters, and inspectors. (Agricultural scientists, who develop ways of improving the quantity and quality of farm crops and animals, are discussed elsewhere in the *Handbook*.) Forestry workers include logging supervisors, timber cutters, and loggers, hunters, and trappers. (Foresters and conservationists—who manage, develop, and help protect trees, minerals, water, and other natural resources—are discussed elsewhere in the *Handbook*.) Fishing workers include skiff operators, fishing vessel deckhands, weir fishers, and sponge hookers.

Requirements for training and personal qualifications vary widely among these occupations. For example, farm and logging workers, other than managers, can learn their jobs in a few weeks by observing and helping experienced workers. These jobs require manual dexterity, strength, stamina, and good hand-eye coordination. On the other hand, because of the scientific and business complexities of modern farming, farm and logging operators and managers increasingly need business training, a college education, and sometimes graduate training. Managerial skill and extensive specialized knowledge are necessary for success.

Demand for food, fiber, and wood will increase as the world population grows. The agricultural, forestry, and fishing industries are expected to easily accommodate this higher demand. However, increasing production costs and foreign competition will limit employment growth in many occupations.

As farms become more expensive to buy and operate, the number of small- and medium-size farms is expected to decline. Fewer and larger farms should result in a decline in employment of farm operators. Employment of farm and logging workers, other than managers, is expected to decline as machinery makes it possible to plant, cultivate, and harvest more crops and timber with fewer workers. Fishers, hunters, and trappers are also projected to decline in number.

On the other hand, the demand for farm managers with specialized skills and knowledge is expected to increase as farming becomes more complex. Employment of nonfarm agricultural occupations—particularly animal caretakers, gardeners, and groundskeepers—also is projected to increase.

The following statement presents more detailed information on farm operators and managers—the largest agricultural, forestry, and fishing occupation.

Farm Operators and Managers

(D.O.T. 180.117, .161, .167 except -014, -022, -050, -054; 401.161; 402.161; 403.161; 404.161; 405.161; 405.361; 407.161; 410.161; 411.161; 412.161; 413.161; 421.161; 446.161)

Nature of the Work

American farm operators and managers direct the activities of one of the world's largest and most productive agricultural sectors. They produce enough food and fiber to meet the needs of our Nation and to export huge quantities to countries around the world.

Farm Operators. Farm operators may be farmer owners or tenant farmers (renters). Their specific tasks are determined by the type of farm they operate. In crop farms—farms growing grain, fiber, fruit, and vegetables—farm operators are responsible for planning, tilling, planting, fertilizing, cultivating, spraying, and harvesting. After the harvest, they make sure that the crops are packaged, loaded, and promptly marketed or stored for resale. On livestock, dairy, and poultry farms, farm operators must plan, feed, and care for the animals and keep barns, pens, coops, and other farm buildings clean and in repair. They also oversee breeding, slaughtering, and marketing activities.

Farm operators perform tasks ranging from setting up and operating machinery to erecting fences and sheds. The size of the farm often determines which of these tasks operators will handle themselves. Operators of large farms have employees who do much of the physical work that small-farm operators do themselves. Although employment on most farms is limited to the farm operator and one or two family workers or hired employees, some large farms have 100 or more full-time and seasonal workers. Some of these workers are in nonfarm occupations, such as truckdriver, sales representative, and bookkeeper.

Farm operators must make many managerial decisions. Farm output is strongly influenced by the weather, disease, and fluctuations in prices of farm products. Farm operators must determine the best time to seed, fertilize, cultivate, and harvest. They must carefully plan the combination of crops they grow so that, if the price of one crop drops, they will have sufficient income from another to make up for it. Also, prices of crops and livestock change from one month to another, and farm operators who plan ahead may be able to store their crops or keep their livestock to take advantage of better prices later in the year. Farm operators may have to secure loans from credit agencies to finance the purchase of machinery, fertilizer, livestock, and feed. They also keep financial records of the farm operation and train and supervise workers in the use of equipment and the performance of farm work.

Farm Managers. The duties and responsibilities of farm managers vary widely. For example, the owner of a very large livestock farm may employ a farm manager to oversee a single activity such as feeding livestock. When managing a small crop farm for an absentee owner, on the other hand, the farm manager may assume all functions from planning the output to participating in planting and harvesting activities. Farm management firms employ highly trained professional farm managers who may manage some or all farm operations or oversee tenant operators of several farms. In these cases, farm managers may establish output goals and monitor production.

Working Conditions

Farming is attractive to persons who prefer a slower pace and the more wholesome rural life to urban living. Even when farming generates a modest income, many farmers earn supplementary income from part-time or seasonal jobs in nearby cities or towns rather than leave farming.

The topography of the land and the climate of an area generally determine the type of farming that is done. For example, wheat, corn, and other grains are most efficiently grown on large farms on level land where large and sophisticated machinery can best be used. Thus, these crops are ideal for the plains of Iowa, Illinois, Nebraska, and Kansas. Crops that require longer growing seasons, such as cotton, tobacco, and peanuts, are grown chiefly in the South. Most of the country's fruits and vegetables come from California, Texas, and Florida. Crops requiring a temperate climate—for example, potatoes—come from Northern States such as Idaho, Washington, and Maine. Dairy herds are best suited for the areas of good pastureland, such as Wisconsin, New York, and Minnesota. Livestock production requires large tracts of grazing land and thus is concentrated in Texas, Nebraska, Iowa, and some Western States.

Many types of farming are seasonal in nature. Although many farm operators and managers on crop farms work from sunup to sundown during the planting and harvesting seasons, they often work on the farm only 6 to 7 months a year, and many have second jobs off the farm.

On farms that raise animals for meat or dairy products, work goes on constantly throughout the year. Because animals must be fed and watered every day and cows must be milked twice daily, operators of these farms rarely get the chance to be away.

Farm work can be extremely hazardous; each year, many farmers are injured by planting and harvesting machinery. They are subject to illnesses and diseases from handling and breathing dangerous pesticides and chemicals and from handling crops that have been sprayed with insecticides. They may be injured or catch diseases transmitted by farm animals.

On very large farms, farm operators spend substantial time meeting with farm managers or farm supervisors in charge of various activities. Professional farm managers overseeing several farms may divide their time between traveling to meet with farm operators and planning and scheduling farm operations while in their offices.

Employment

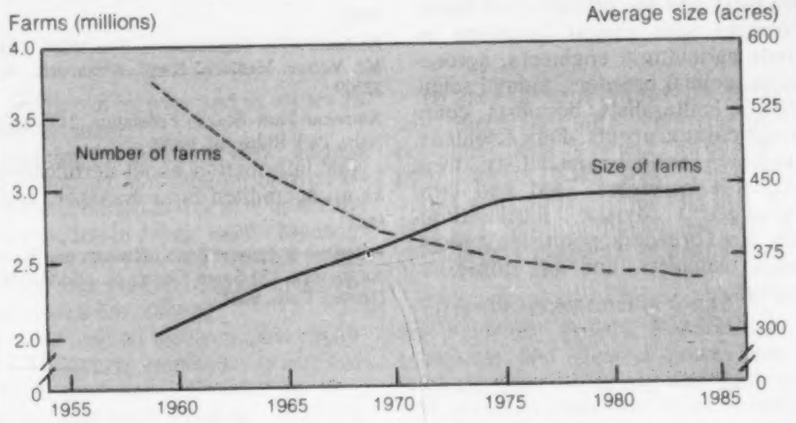
In 1984, farm operators and managers held 1,442,000 jobs. Almost 3 out of 5 managed crop production activities and over 2 out of 5 managed livestock production activities. A relatively small number were involved in agricultural services such as contract harvesting and farm labor contracting.

Training, Other Qualifications, and Advancement

Growing up on a family farm and participating in farming programs for young people sponsored by the Future Farmers of America or the 4-H clubs are important sources of training for prospective farmers. However, modern farming requires increasingly complex scientific and business decisions. Even young people who have lived on farms must acquire a strong educational background. Their high school training should include courses in mathematics and the sciences. Completion of a 2-year and preferably a 4-year program in a college of agriculture is becoming necessary. A bachelor's degree in agriculture is essential for persons without

With fewer farms, farming as a way of life is decreasing in importance.

Farms are decreasing in number but increasing in size.



SOURCES: U.S. Department of Commerce; U.S. Department of Agriculture

farm experience who aspire to become farmers or farm managers.

Students should select the college most appropriate to their specific interests and location. All States have land grant colleges including a college of agriculture; their major programs of study include areas such as dairy science, agricultural economics and business, horticulture, crop and fruit science, soil science, and animal science. Also, colleges usually offer special programs of study concerning products important to the area in which they are located, such as animal science programs at colleges in the Western and Plains States. Whatever one's interest, the college curriculum should include courses in farm management and in business and finance.

Professional status can be acquired through certification as an accredited farm manager (AFM) by the American Society of Farm Managers and Rural Appraisers. Applicants must have several years' farm experience and the appropriate academic background—a bachelor's degree or preferably a master's degree in a field of agricultural science—and must pass courses and examinations relating to business, financial, and legal aspects of farm management.

It is necessary to keep abreast of continuing advances in farming methods. Farm operators should be willing to try new processes and adapt to constantly changing technologies to produce their crops or raise their livestock more efficiently. Operators also must have enough technical knowledge of crops and growing conditions and plant and animal diseases to be able to make decisions that ensure the successful operation of their farms. They also must have the managerial skills necessary to organize and operate a business. Mechanical aptitude and the ability to work with tools of all kinds also are valuable skills for the operator of a small farm, who often must maintain and repair machinery or farm structures. A basic knowledge of accounting and bookkeeping can be helpful in keeping financial records, and a knowledge of credit sources is essential.

Job Outlook

The expanding world population is increasing the demand for food and fiber. However, increasing productivity in our highly efficient agricultural sector is expected to meet easily domestic and export requirements. Although requirements for farm land, machinery, and equipment will increase, labor requirements in the agricultural sector will decrease. Thus, employment of farm operators and managers combined is expected to continue to decline through the mid-1990's, but at a slower rate than in the past. The overwhelming majority of job openings will result from the need to replace farmers who retire or leave the occupation for economic or other reasons.

The trend toward fewer and larger farms, primarily through mergers, is expected to continue to reduce the number of jobs for farm operators. Although a farm can be acquired by inheritance, purchasing a farm is becoming increasingly difficult and prohibitively expensive. The costs of farm land, machinery, and equipment have been rapidly increasing, as have operating costs—livestock, feed, seed, fertilizer, and fuel. In addition, sufficient funds are required to withstand the adverse effects of climate and price fluctuations upon farm output and income, as obtaining a loan may be difficult. Also, the complexity of modern farming and keen competition among farmers leave little room for the marginally successful farmer or the 'gentleman'' farmer who considers farming a hobby rather than a necessity. Small- and medium-size farms, many of which do not generate sufficient income to support the desired standard of living, are expected to decrease in number.

The increase in the average size of farms and in the complexity of farming are expected to spur demand for highly trained and experienced farm managers. Additional demand will come from the increasing number of absentee owners who, rather than work their farms, often hire farm managers to run the farm or oversee tenant farmers.

Earnings

In 1984, average annual earnings of farm operators and managers were $16,400. However, farm income varies greatly from year to year, since prices of farm products fluctuate depending upon weather conditions that influence the amount and quality of farm output. A farm that shows a large profit in one year may show a loss in the following year. Many farmers—primarily small—have off-farm income often several times larger than their farm income.

Farm income also varies greatly depending upon the type and size of farm. According to the U.S. Department of Agriculture, in 1983, vegetable, melon, and other crop farms generated an average income of over $45,000. On the other hand, livestock and tobacco farms generated less than $10,000 in income, on the average. Generally, large farms generate more income than small farms. Exceptions include some specialty farms producing low-volume but high-value horticultural and fruit products.

Related Occupations

Farmers and farm managers strive to improve the quality of agricultural products and the efficiency of farms. Workers with similar functions include agricultural engineers, agronomists, animal breeders, animal scientists, apiculturalists, botanists, county-agricultural agents, dairy scientists, extension service specialists, farm worker supervisors, feed and farm management advisors, horticulturalists, plant breeders, poultry scientists, range managers, and soil conservationists.

Sources of Additional Information

For general information about farming and agricultural occupations, contact:

National FFA Organization, Box 15160, 5632 Mt. Vernon Memorial Hwy., Alexandria, Va. 22309.

American Farm Bureau Federation, 225 Touhy Ave., Park Ridge, Ill. 60068.

For information about certification as an accredited farm manager, contact:

American Society of Farm Managers and Rural Appraisers, 950 South Cherry St., Suite G16, Denver, Colo. 80222.

For general information about farm occupations and 4-H activities, contact your local county extension service office.

For information about agricultural education, contact:

National Association of State Universities and Land Grant Colleges, Division of Agriculture, One DuPont Circle, Suite 710, Washington, D.C. 20036.

National Postsecondary Agricultural Student Organization, Box 34, Cobleskill, N.Y. 12043.

Higher Education Program, U.S. Department of Agriculture, Washington, D.C. 20250 (telephone: 202-447-7854).

Mechanics and Repairers

In our high-technology society, machines of one type or another touch almost all aspects of our lives. Machines, including robots, produce our goods. Transportation equipment carries both goods and people anywhere in the world. Telephones and other communications equipment convey information quickly and efficiently. Appliances make our household chores easier. Mechanics and repairers maintain and repair these and the many other types of machines we rely on.

One-fourth of all mechanics and repairers work on motor vehicles in occupations such as automotive and motorcycle mechanic, diesel mechanic, and automotive body repairer. The remaining three-fourths work on a variety of machines in occupations such as home appliance and power tool repairer, data processing equipment repairer, communications equipment mechanic, and musical instrument repairer and tuner.

Mechanics and repairers work in all industries. Almost one-fifth work in manufacturing—the majority in plants that produce durable goods such as steel, automobiles, and aircraft. Another one-fifth work in retail trade—mainly in firms that sell and service automobiles, household appliances, farm implements, and other mechanical equipment. About one-seventh work in shops that service machines of all types. Most of the remaining mechanics and repairers work in the transportation, construction, and public utilities industries and in all levels of government.

Training for most mechanic and repairer occupations requires both classroom instruction in machine operation and practice in repair work. Mechanics get this training through high school and postsecondary programs and on-the-job training.

For almost all mechanic and repairer occupations, employers prefer high school graduates. Courses in shop math, blueprint reading, drafting, woodworking, metalworking, and electronics give students basic mechanical knowledge and skills.

Training in specific areas—home appliance repair, automotive maintenance and repair, television and home entertainment equipment repair—is available through high schools, private vocational schools, community colleges, correspondence schools, and the Armed Forces. These vocational programs include instruction in machine operation and experience with actual or demonstration equipment. Although completion of such training does not assure a job, employers increasingly prefer to hire people with some training or experience.

New mechanics and repairers usually receive on-the-job training from their employer. This training may involve classroom instruction and practice work with demonstration equipment. However, it frequently consists only of supervision by an experienced worker.

To keep up with improved technology, mechanics and repairers must continue their training throughout their careers. They study the repair books and technical manuals that accompany new equipment and attend classes run by equipment manufacturers.

Physical requirements for work in this field vary greatly. For example, telephone and electric power lineworkers must be strong and agile to lift heavy equipment and work in awkward positions. Electronic home entertainment equipment repairers need good vision and excellent finger dexterity. For occupations in which the repairer deals with customers, the ability to work with people is important.

For most mechanic occupations, advancement is limited to supervisory positions. Some of these occupations, however, offer good opportunities for self-employment.

Employment of mechanics and repairers as a group is expected to increase about as fast as the average for all occupations through the mid-1990's to keep up with maintenance and repair work associated with increased use of household appliances, automobiles, computers, and industrial and other machinery. Although thousands of jobs will be created by growth in demand, most openings will arise in this relatively large occupational category as experienced workers leave the field for a variety of reasons.

Vehicle and Mobile Equipment Mechanics and Repairers

Vehicle and mobile equipment mechanics and repairers maintain and repair a wide variety of motor vehicles and mobile equipment. They service vehicles such as automobiles, trucks, buses, aircraft, boats, and motorcycles. They also work on heavy construction, logging, railroad, and farm machinery, such as earthmovers, locomotives, tractors, and combines, as well as smaller gasoline-powered equipment such as portable generators and lawnmowers.

Mechanical aptitude and manual skills are essential to vehicle and mobile equipment mechanics and repairers. They also need reading and writing skills in order to consult repair and technical manuals, read work orders, and write parts lists and descriptions of their work. They must be able to work efficiently and with precision since their earnings often depend on how rapidly they can correctly perform maintenance or repairs. They must also be capable of handling heavy or unwieldy parts or components.

Employers usually prefer high school graduates but frequently hire those without high school diplomas if they can read and write adequately. Most mechanics and repairers acquire their skills on the job following the instructions of experienced workers, reading repair manuals, and solving problems on their own. Increasingly, formal mechanic training acquired in high school, vocational or technical school, community or junior college, or in the Armed Forces is an asset to persons entering mechanic and repairer careers.

This section describes six groups of vehicle and mobile equipment mechanics and repairers: Aircraft mechanics and engine specialists; automotive and motorcycle mechanics; automotive body repairers; diesel mechanics; farm equipment mechanics; and mobile heavy equipment mechanics. Other mechanic and repairer careers are described in subsequent sections.

Aircraft Mechanics and Engine Specialists

(D.O.T. 621.281 except -030, .381-010, -014, .684-014; 806.281-038, .684-110; 807.261, .381-014, .684-018)

Nature of the Work

Most travelers hardly think twice about flying thousands of feet above the ground. The confidence they have in aircraft is a tribute to the mechanics (also referred to as "technicians") who maintain them. To keep aircraft in top operating condition, mechanics perform scheduled maintenance, make repairs, and complete inspections required by the Federal Aviation Administration (FAA).

Many mechanics specialize in scheduled maintenance. Following a schedule that is based on the number of hours flown, calendar days, or a combination of these factors, mechanics inspect the engines, landing gear, instruments, pressurized sections, accessories—brakes, valves, pumps, and air-conditioning systems, for example—and other parts of the aircraft and do the necessary maintenance. They may examine an engine through specially designed openings while working from ladders or scaffolds, or use hoists or lifts to remove the entire engine from the craft. After taking the engine apart, mechanics may use sensitive instruments to measure parts for wear, and use X-ray and magnetic inspection equipment to check for invisible cracks. Worn or defective parts are replaced. They also may repair sheet-metal surfaces, measure the tension of control cables, or check for rust, distortion, and cracks in the fuselage, wings, and tail. Mechanics test the equipment to make sure the repairs were made properly.

Mechanics specializing in repair work use the pilot's description of a problem to find and fix faulty equipment. For example, during a preflight check, a pilot may discover that the aircraft's gas gauge does not work. To solve the problem, mechanics may check the electrical connections, replace the gauge, or use electrical test equipment to make sure no wires are broken or shorted. They work as fast as safety permits so that the aircraft can be put back into service quickly.

Mechanics may work on one or many different types of aircraft, such as jets, propeller-driven airplanes, and helicopters, or, for efficiency, may specialize in one section of a particular type of aircraft, such as the engine or electrical system. In small, independent repair shops, mechanics usually inspect and repair many different types of aircraft.

Working Conditions

Mechanics usually work in hangars or other indoor areas. However, if the hangars are full or if repairs must be made quickly, they may work outdoors, sometimes in unpleasant weather. This occurs most often to airline mechanics who work at airports because, to save time, minor repairs and preflight checks often are made at the terminal. Mechanics often work under the pressure of time to maintain flight schedules or, in general aviation, to keep from inconveniencing customers. At the same time, mechanics must maintain safety standards.

Frequently, mechanics must lift or pull as much as 50 pounds. They often stand, lie, or kneel in awkward positions and occasionally must work in precarious positions on scaffolds or ladders. Noise and vibration are common when testing engines. Aircraft mechanics generally work 40 hours a week on 8-hour shifts around the clock.

Employment

Aircraft mechanics held about 106,000 jobs in 1984. About two-fifths worked for airlines, over one-fourth for the Federal Government, and over one-tenth for aircraft assembly firms. Most of the rest were general aviation mechanics, the majority of whom worked for independent repair shops or companies that operate their own planes to transport executives and cargo. Very few mechanics were self-employed. (The accompanying chart indicates the percent distribution of wage and salary jobs by industry.)

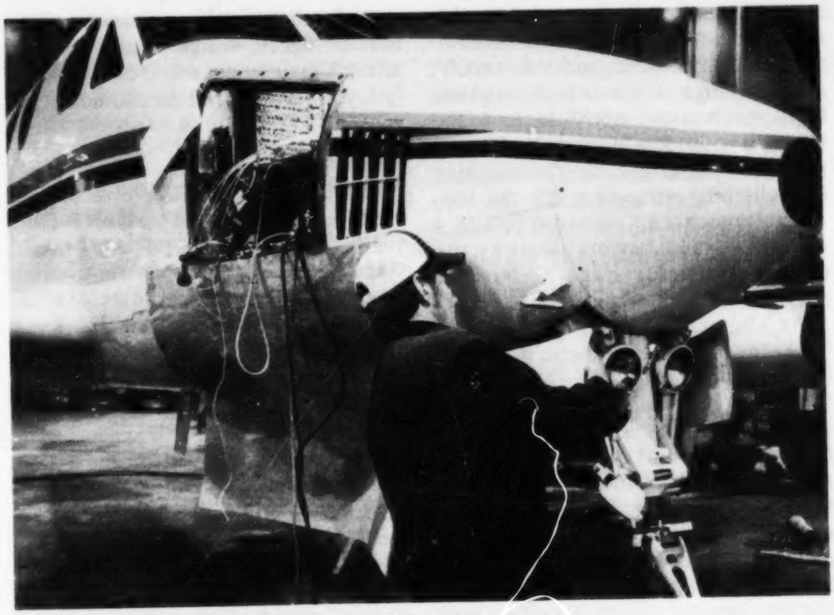
Most airline mechanics work near large cities at the airlines' main stops. Many are civilians employed by the Armed Forces and work at military aviation installations. Others work for the FAA, many in the headquarters at Oklahoma City. Mechanics for independent repair shops work at airports in every part of the country.

Training, Other Qualifications, and Advancement

The majority of mechanics who work on civilian aircraft are licensed by the FAA as "airframe mechanics," "powerplant mechanics," or "aircraft inspectors." Airframe mechanics are qualified to work on the fuselage, wings, landing gear, and other structural parts of the plane; powerplant mechanics are qualified only for work on the engine. Combination airframe-and-powerplant mechanics can work on any part of the plane, and those with an inspector's license can certify inspection work completed by other mechanics. Unlicensed mechanics are supervised by those with licenses.

The FAA requires at least 18 months of work experience for an airframe or powerplant license. For a combined license, at least 30 months of experience working with both engines and airframes are required. To obtain an inspector's license, a mechanic must have held an airframe-and-powerplant license for at least 3 years. Applicants for all licenses also must pass written and oral tests and demonstrate that they can do the work authorized by the license.

Although a few people become mechanics through on-the-job training, most learn their job in the Armed Forces or in trade schools certified by the FAA. Courses in these trade schools generally last from 18 months to 2 years and provide training with the tools and equipment used on the job. For an FAA license, attendance at such schools may substitute for work experience. However, these schools do not guarantee jobs or FAA licenses.

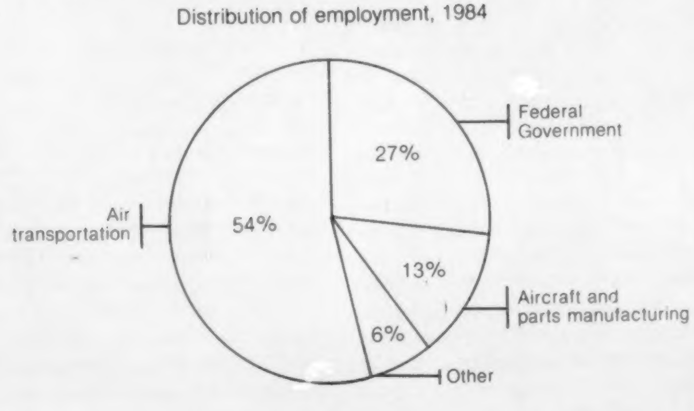


Mechanics inspect aircraft on a scheduled basis

Some aircraft mechanics in the Armed Forces acquire enough general experience to satisfy the work experience requirements for the FAA license. With additional study, they may pass the licensing exam. Generally, however, jobs in the military services are too specialized to provide the broad experience required by the FAA. Most have to complete the entire training program at a trade school, although a few receive some credit for the material they learned in the service. Military experience is a great advantage when seeking employment; employers consider trade school graduates who have this experience to be the most desirable applicants.

A high school diploma or its equivalent is necessary for all prospective aircraft mechanics. Courses in mathematics, physics, chemistry, electronics, computer science, and mechanical drawing are helpful because knowledge of the principles involved in the operation of an aircraft often is necessary to make repairs. As new and more complex aircraft are designed, mechanics must update their skills. Recent technological advances in aircraft maintenance necessitate a strong background in electronics—both for

Although aircraft mechanics are concentrated in the transportation industry, a substantial proportion work for the Federal Government.



SOURCE: Bureau of Labor Statistics

acquiring and retaining jobs in this field.

Aircraft mechanics must do careful and thorough work which requires high mechanical aptitude and the strength to lift heavy parts and tools. Agility is important for the reaching and climbing necessary for the job. Aircraft mechanics must not be afraid of heights since they may work on the top of wings and fuselages on large jet planes.

As aircraft mechanics gain experience, they advance to more responsible jobs. Opportunities are best for those who have an aircraft inspector's license. A mechanic may advance to head mechanic (or crew chief), to inspector, to head inspector, and to shop supervisor. In the airlines, where promotion is often determined by examination, a few supervisors advance to executive positions. Those with broad experience in maintenance and overhaul may become inspectors with the FAA. With additional business training, some may open their own repair shops.

Job Outlook

The number of aircraft mechanics is expected to increase about as fast as the average for all occupations through the mid-1990's. A growing population and rising incomes are expected to stimulate the demand for airline transportation, and the number of private and commercial aircraft is expected to grow. Most job openings are expected to arise from the need to replace mechanics who transfer to other fields of work, or leave the labor force.

Job opportunities are expected to be best in general aviation, particularly for qualified mechanics who are willing to relocate. Since wages in small companies tend to be relatively low, there is less competition for these jobs than in the airlines. Also, some jobs will become available as experienced mechanics leave for better paying jobs with airlines or large private companies. In contrast with general aviation, competition for airline jobs should remain keen because the high wages and travel benefits attract more qualified applicants than the number of available openings.

The number of mechanics employed by the Federal Government is expected to grow. Opportunities will fluctuate with changes in defense spending. Declines in air travel during recessions force airlines to curtail the number of flights, which results in less aircraft maintenance and consequently layoffs for aircraft mechanics.

Earnings

In 1984, the median annual salary of aircraft mechanics was $25,000. Mechanics who worked on jets generally earned more than those working on other aircraft. The top 10 percent of all aircraft mechanics earned over $35,000 a year. Airline mechanics and their immediate families receive reduced fare transportation on their own and most other airlines.

Mechanics employed by most major airlines are covered by union agreements. Their earnings generally are higher than mechanics working for other employers. The principal unions in this field are the International Association of Machinists and Aerospace Workers, and the Transport Workers Union of America. Some mechanics are represented by the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

Related Occupations

Workers in some other occupations that involve similar mechanical and electrical work are automotive body repairers, automotive mechanics, electricians, elevator repairers, and telephone maintenance mechanics.

Sources of Additional Information

For general information about aircraft mechanics, write to:

Aviation Maintenance Foundation, P.O. Box 739, Basin, Wyo. 82410.

For further information, request *Aviation Maintenance*, publication GA-300-133 (enclose a self-addressed mailing label), from:

U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

Information about jobs in a particular airline may be obtained by writing to the personnel manager of the company. For addresses of airline companies, write to:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

For information on jobs in a particular area, contact employers at local airports or local offices of the State employment service.

Automotive and Motorcycle Mechanics

(D.O.T. 620.261-010, -012, -030, and -034; .281-010, -026, -034, -038, -054, -062, -066, and -070; .381-010 and -022; .684-018 through -026; 625.281-010; 706.381-046; 721.281-010; 806.361-026 and .684-038; 807.664-010 and .684-022; and 825.381-014)

Nature of the Work

Automotive mechanics, often called service technicians, repair and service automobiles and occasionally small trucks, such as vans and pickups, with gasoline engines. (Mechanics who work on diesel-powered trucks, buses, and equipment are discussed in the *Handbook* statement on diesel mechanics.) Motorcycle mechanics repair and service motorcycles, motorscooters, mopeds, and occasionally small all-terrain vehicles. Anyone whose car or motorcycle has broken down knows the importance of the mechanic's job. The ability to make a quick and accurate diagnosis, one of the mechanic's most valuable skills, requires good reasoning ability and a thorough knowledge of automobiles or motorcycles. In fact, many mechanics consider diagnosing "hard to find" troubles one of their most challenging and satisfying duties.

When mechanical or electrical troubles occur, mechanics first get a description of the symptoms from the owner or, if they work in a dealership, the repair service estimator who wrote the repair order. The mechanic may have to test drive the vehicle or use testing equipment, such as engine analyzers, spark plug testers, or compression gauges, to locate the problem. Once the cause of the problem is found, mechanics make adjustments or repairs. If a part is damaged or worn beyond repair, or cannot be fixed at a reasonable cost, they replace it, usually after consultation with the vehicle owner.

To prevent breakdowns, during routine service mechanics check parts and adjust, repair, or replace them before they go bad. They usually follow a checklist to be sure they examine all important parts, such as belts, hoses, steering systems, spark plugs, brake and fuel systems, wheel bearings, and other potentially troublesome items.

Mechanics use a variety of tools in their work. They use power tools such as pneumatic wrenches to remove bolts quickly; machine tools such as lathes and grinding machines to rebuild brakes and other parts; welding and flame-cutting equipment to remove and repair exhaust systems and other parts; jacks and hoists to lift cars and engines; and a growing variety of electronic service equipment, such as infrared engine analyzers and computerized diagnostic devices. They also use many common handtools such as screwdrivers, pliers, and wrenches to work on small parts and get at hard-to-reach places.

Automotive and motorcycle mechanics in larger shops increasingly specialize. For example, *automatic transmission mechanics* work on gear trains, couplings, hydraulic pumps, and other parts of automatic transmissions. Because these are complex mechanisms, their repair requires considerable experience and training, including a knowledge of hydraulics. *Tune-up mechanics* adjust the ignition timing and valves, and adjust or replace spark plugs and other parts to ensure efficient engine performance. They often use electronic test equipment to help them adjust and locate malfunctions in fuel, ignition, and emissions control systems.

Automotive air-conditioning mechanics install air-conditioners and service components such as compressors and condensers. *Front-end mechanics* align and balance wheels and repair steering mechanisms and suspension systems. They frequently use special alignment equipment and wheel-balancing machines. *Brake repairers* adjust brakes, replace brake linings and pads, repair hydraulic cylinders, turn disks and drums, and make other repairs on brake systems. Some mechanics specialize in both brake and front-end work.

Automotive-radiator mechanics clean radiators with caustic solutions, locate and solder leaks, and install new radiator cores or complete replacement radiators. They also may repair heaters and air-conditioners, and solder leaks in gasoline tanks.

Working Conditions

Generally, automotive and motorcycle mechanics work indoors. Most repair shops are well ventilated and lighted, but some are drafty and noisy. Mechanics frequently work with dirty and greasy parts, and in awkward positions. They often must lift heavy parts and tools. Minor cuts, burns, and bruises are common, but serious accidents may be avoided when the shop is kept clean and orderly and safety practices are observed.

Employment

Automotive and motorcycle mechanics held about 922,000 jobs in 1984. Most were automotive mechanics; they primarily worked for automotive dealers, automotive repair shops, gasoline service stations, and department, automotive, and home supply stores that have automotive service facilities. Others were employed by Federal, State, and local governments, taxicab and automobile leasing companies, and other organizations that repair their own fleets of automobiles. Motor vehicle manufacturers employed some mechanics to adjust and repair cars at the end of assembly lines. About 1 out of 5 automotive mechanics was self-employed.

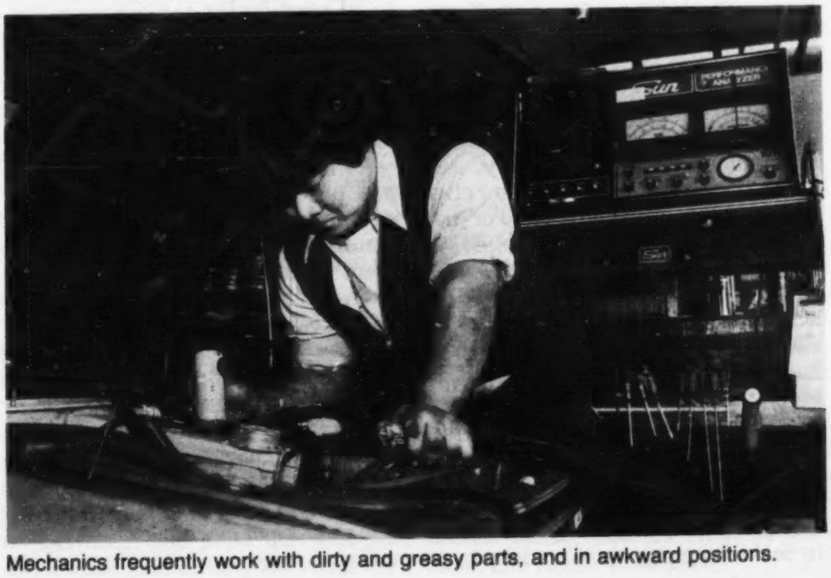
Most motorcycle mechanics work for motorcycle dealers. Others maintain police motorcycles for local government, or work for independent repair shops that specialize in modifying or customizing motorcycles.

Employment of automotive and motorcycle mechanics is distributed about the same as the population.

Training, Other Qualifications, and Advancement

Many automotive mechanics still learn the trade by assisting and working with experienced mechanics. However, automotive technology is rapidly increasing in sophistication, and most training authorities recommend that persons seeking trainee automotive mechanic jobs complete a formal training program. Programs in automotive mechanics are offered in high schools, community colleges, and public and private vocational and technical schools. High school programs, particularly, vary greatly in quality. Postsecondary automotive mechanic training programs vary greatly in format. Some concentrate the instruction in only 6 months or a year, depending on how many hours the student must attend each week. Some community college programs spread the training out over 2 years, supplement the automotive training with instruction in academic subjects, and award an associate degree.

Knowledge of electronics is increasingly desirable for automotive and motorcycle mechanics. Electronics is being used in a growing variety of automotive and motorcycle components. Engine controls and dashboard instruments were among the first components to use electronics, but now electronics are being used in brakes, transmissions, steering systems, and a variety of other components. In the past, problems involving electrical systems or electronics were usually handled by a specialist, but electronics are becoming so commonplace that most automotive mechanics must be familiar with at least the basic principles in order to recognize when



Mechanics frequently work with dirty and greasy parts, and in awkward positions.

an electronic malfunction may be responsible for a problem.

Most persons hired as trainee motorcycle mechanics are motorcycle enthusiasts who acquired some basic mechanic skills by servicing, repairing, and customizing their own motorcycles. Few formal training programs in motorcycle mechanics exist.

Beginners usually start as helpers, lubrication workers, or gasoline station attendants and gradually acquire skills by working with experienced mechanics. Although a beginner can make simple repairs after a few months' experience, it usually takes 1 to 2 years of experience to become a service mechanic and make the more difficult types of routine service and repairs. An additional 1 to 2 years are usually required to become thoroughly experienced and familiar with all types of repairs. Difficult specialties, such as transmission repair, require another year or two of training. In contrast, automotive radiator mechanics and brake specialists, who do not need an all-round knowledge of automotive repair, may learn their jobs in considerably less time.

In the past, many persons have entered automotive mechanics through 3- or 4-year formal apprenticeship programs. However, as formal automotive training programs have increased in popularity, the number of employers willing to make such a long-term apprenticeship commitment has greatly declined.

For trainee mechanic jobs, employers look for people with mechanical aptitude and a knowledge of automobiles and motorcycles. Experience working on motor vehicles in the Armed Forces or as a hobby is valuable. Completion of high school is also an advantage in obtaining an entry job. Courses in automotive repair, electronics, physics, chemistry, and mathematics can help a person better understand how an automobile or motorcycle operates.

Mechanics usually buy their handtools, and beginners are expected to accumulate tools as they gain experience. Many experienced mechanics have thousands of dollars invested in tools. Employers furnish power tools, engine analyzers, and other test equipment.

Employers increasingly send experienced automotive and motorcycle mechanics to factory training centers to learn to repair new models or to receive special training in electronic fuel injection or air-conditioning repair. Motor vehicle dealers may also send promising beginners to factory-sponsored mechanic training programs. Factory representatives come to many shops to conduct short training sessions. Mechanics also must read service and repair manuals to keep abreast of new technology.

Voluntary certification by the National Institute for Automotive Service Excellence is widely recognized as a standard of achievement for automobile mechanics. Mechanics are certified in 1 or more of 8 different service areas, such as tune-ups, brake and front-end work, or electrical system repair. General automotive mechanics are certified in all eight areas. For certification in each area, mechanics must have at least 2 years of experience and pass a written examination; completion of an automotive mechanic program in high school, vocational or trade school, or community or junior college may be substituted for 1 year of experience. Certified mechanics must retake the examination at least every 5 years.

Experienced mechanics who have leadership ability may advance to shop supervisor or service manager. Mechanics who work well with customers may become automotive repair service estimators. Some with sufficient funds open independent repair shops.

Job Outlook

Job opportunities in automotive and motorcycle mechanics are expected to be plentiful for persons who complete training programs in high school or at community colleges and vocational and technical schools. Persons without formal mechanic training are likely to face competition for entry level automotive mechanic jobs, but lack of formal training should be less of a disadvantage for persons seeking motorcycle mechanic jobs because there are relatively few training programs for motorcycle mechanics. Mechanic careers are attractive to many because they afford the opportunity for good pay and the satisfaction of skilled work with one's hands.

Employment of automotive and motorcycle mechanics is expected to increase faster than the average for all occupations through the mid-1990's. The number of mechanics is expected to increase because expansion of the driving age population and rising consumer purchasing power will increase the number of motor vehicles on the road. The growing complexity of automotive technology, such as the use of electronic and emissions control equipment, increasingly necessitates that cars and motorcycles be serviced by professionals, contributing to growth in demand for mechanics.

More job openings are expected for automotive and motorcycle mechanics than for most other occupations. Despite projected faster-than-average growth in employment, the main source of job openings will be the need to replace experienced workers who transfer to other occupations, retire, or stop working for other reasons. Replacement needs will be substantial, in large part, because of the size of the occupation.

Most persons who enter the occupation may expect steady work because changes in economic conditions have little effect on the automotive repair business. During a downturn, however, some employers may be more reluctant to hire inexperienced workers.

Earnings

Highly skilled automotive mechanics employed by automobile dealers in 24 cities had average hourly earnings of $12.32 in 1984. Less skilled service mechanics who perform routine service and make minor repairs had average hourly earnings of $9.31, and lubricators averaged an estimated $8.48 an hour in 1984.

Experienced motorcyle mechanics averaged $350 a week in 1984, based on a survey of motorcycle dealerships and other employers. Their weekly pay ranged from about $320 a week to more than $400 a week, depending on the size of the shop and the region of the country.

Many experienced mechanics employed by automotive and motorcycle dealers and independent repair shops receive a commission related to the labor cost charged to the customer. Under this method, weekly earnings depend on the amount of work completed by the mechanic. Employers frequently guarantee commissioned mechanics a minimum weekly salary.

Most mechanics work between 40 and 48 hours a week, but many work even longer hours during busy periods. In some areas of the country, motorcycle mechanics work fewer hours during the winter when inclement weather makes motorcycle riding difficult.

Some mechanics are members of labor unions. The unions include the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

Related Occupations

Other workers who repair and service motor vehicles include automotive body repairers, customizers, repair service estimators, transportation equipment painters, and truck, bus, and diesel mechanics.

Sources of Additional Information

For more details about work opportunities, contact local automotive and motorcycle dealers and repair shops; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may have information about training programs.

A directory of accredited private trade and technical schools with training programs for automotive and motorcycle mechanics is available from:

National Association of Trade and Technical Schools, 2251 Wisconsin Ave. NW., Washington, D.C. 20007.

Information on automotive and motorcycle mechanic training is available from:

Motor and Equipment Manufacturers Association, Technical Training Council, 222 Cedar Lane, Teaneck, N.J. 07666.

For general information about the work of automotive mechanics, write to:

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst, Ill. 60126.

Motor Vehicle Manufacturers Association of the U.S., Inc., 300 New Center Bldg., Detroit, Mich. 48202.

Information on how to become a certified automotive mechanic is available from:

National Institute for Automotive Service Excellence, Suite 515, 1825 K St. NW., Washington D.C. 20006.

Automotive Body Repairers

(D.O.T. 620.364 and .684-034; 807.267; .281; .361-010; .381-010, -018, and -022; .484; .684-010; and 865.684-010)

Nature of the Work

Thousands of motor vehicles are damaged in traffic accidents every day. Although some are junked, most can be made to look and drive like new. Automotive body repairers straighten bent bodies, remove dents, and replace crumpled parts that are beyond repair. Usually, they can fix all types of vehicles, but most body repairers work on cars and small trucks. A few work on large trucks, buses, or tractor-trailers.

When a damaged vehicle is brought into the shop, body repairers generally receive instructions from their supervisors, who have determined which parts are to be restored or replaced and how much time the job should take.

Automotive body repairers use special machines to restore damaged frames and body sections to their original shape and location. They chain or clamp the frames and sections to alignment machines that usually use hydraulic pressure to align the damaged metal. For "unicoupe" designs, which are built without frames, they also use bench systems to return body sections to precise alignment.

Body repairers remove badly damaged sections of body panels with a pneumatic metal-cutting gun or acetylene torch and weld in new sections to replace them. Repairers pull out less serious dents with a hydraulic jack or hand prying bar, or knock them out with handtools or pneumatic hammers. They smooth out small dents and creases by holding a small anvil against one side of the damaged area while hammering the opposite side. They remove very small pits and dimples with pick hammers and punches.

Body repairers also repair or replace the plastic body parts used increasingly on newer model vehicles. They remove the damaged panels and determine the type of plastic from which they are made. With most types, they can apply heat from a hot-air welding gun or by immersion in hot water, and press the softened panel back into its original shape by hand. They replace plastic parts which are more difficult to repair.

Body repairers use plastic or solder to fill small dents which cannot be worked out of the plastic or metal panel. On metal panels, they then file or grind the hardened filler to the original shape and sand it before painting. In many shops, automotive painters do the painting. (These workers are discussed in the *Handbook* statement on transportation equipment painters.) In smaller shops, workers often do both body repairing and painting. A few body repairers specialize in repairing fiberglass car bodies.

Some body repairers specialize in installing glass in automobiles and other vehicles. Glass installers remove broken, cracked, or pitted windshields and window glass. Curved windshields are purchased precut from the manufacturer, but flat windows sometimes must be cut from a sheet of safety glass. Glass installers apply a moisture proofing compound along the edges of the glass, place it in the vehicle, and install rubber strips around the sides of the windshield or window to make it secure and weather proof.

Body repair work has variety and challenge—each damaged vehicle presents a different problem. Repairers must develop appropriate methods for each job, using their broad knowledge of automotive construction and repair techniques.

Body repairers usually work alone with only general directions from supervisors. In some shops, they may be assisted by helpers or apprentices. In large shops, body repairers may specialize in one type of repair, such as frame straightening or door and fender repairing.

Working Conditions

Automotive body repairers work indoors in body shops which are noisy because of the banging of hammers against metal and the whir of power tools. Most shops are well ventilated, but often they are dusty and smell of paint. Body repairers often work in awkward or cramped positions, and much of their work is strenuous and dirty. Hazards include cuts from sharp metal edges, burns from torches and heated metal, injuries from power tools, and fumes from paint.

buy their own tools, but employers usually furnish power tools. Trainees generally accumulate tools as they gain experience, and many workers have thousands of dollars invested in tools.

An experienced automotive body repairer with supervisory ability may advance to shop supervisor. Some workers open their own body repair shops. Others become automobile damage appraisers for insurance companies.

Automotive body repairers sand body panels before painting.

Employment

Automotive body repairers held more than 183,000 jobs in 1984. Most worked for shops that specialized in body repairs and painting, and for automobile and truck dealers. Others worked for organizations that maintain their own motor vehicles, such as trucking companies and buslines. A few worked for motor vehicle manufacturers. About 1 automotive body repairer out of 4 was self-employed.

Automotive body repairers work in every section of the country. Jobs are distributed in about the same way as the population.

Training, Other Qualifications, and Advancement

Many automotive body repairers enter the occupation by transfer from related helper positions. Persons in good physical condition who know how to use handtools learn the trade as helpers, picking up skills on the job from experienced body repairers. Helpers begin by assisting body repairers in tasks such as removing damaged parts and installing repaired parts. They learn to remove small dents and to make other minor repairs. They then progress to more difficult tasks such as body straightening. Generally, skill in all aspects of body repair requires 3 to 4 years of on-the-job training.

Although there is no educational requirement, most employers prefer to hire high school graduates. Completion of a formal training program in automotive body repair is highly desirable because advances in technology in recent years have greatly changed the structure, the components, and even the materials used in automobiles, requiring many new skills and creating many new repair problems. Automotive body repair training programs are offered by many high schools, vocational schools, private trade schools, and community colleges. Formal training in automotive body repair can enhance chances for employment and speed promotion to a journeyman position.

Certification by the National Institute for Automotive Service Excellence, which is voluntary, is recognized as a standard of achievement for automotive body repairers. To be certified, a body repairer must pass a written examination and must have at least 2 years of experience in the trade. Completion of a high school, vocational school, trade school, or community college program in automotive body repair may be substituted for 1 year of work experience. Automotive body repairers must retake the examination at least every 5 years to retain certification.

Automotive body repairers must

Job Outlook

Employment of automotive body repairers is expected to increase about as fast as the average for all occupations through the mid-1990's. As the number of motor vehicles in operation grows with the Nation's population, the number damaged in accidents will increase as well. In addition, requirements for body repairers will increase because new, lighter weight automotive designs are prone to greater collision damage than older, heavier designs. The need to replace experienced repairers who retire, transfer to other occupations, or stop working for other reasons will account for the majority of job openings.

The automotive repair business is not very sensitive to changes in economic conditions, and experienced body repairers are rarely laid off. Although major body damage must be repaired if a vehicle is to be restored to safe operating condition, repair of minor dents and crumpled fenders can often be deferred. As a result, most employers hire fewer new workers during an economic slowdown. Thus, persons seeking to enter this occupation may face increased competition for jobs during recessions.

Earnings

Body repairers employed by automobile dealers in 24 large metropolitan areas had average hourly earnings of about $14.10 in 1984. Average earnings generally were highest in the West and lowest in the Northeast. Helpers and trainees usually earn from 30 to 60 percent of the earnings of skilled workers.

Many body repairers employed by automotive dealers and repair shops are paid a commission, usually about half of the labor cost charged to the customer. Under this method, earnings depend on the amount of work assigned to the repairer and how fast it is completed. Employers frequently guarantee commissioned workers a minimum weekly salary. Helpers and trainees usually receive an hourly rate until they are skilled enough to work on commission. Body repairers who work for trucking companies, buslines, and other organizations that maintain their own vehicles usually receive an hourly wage. Most body repairers work 40 to 48 hours a week.

Many automotive body repairers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Most body repairers who are union members work for large automobile dealers, trucking companies, and buslines.

Related Occupations

Repairing damaged motor vehicles often involves working on their mechanical components as well as their bodies. Automotive body repairers often work closely with the following related occupations: Automotive repair service estimators, automotive mechanics, automotive painters and body customizers, and diesel mechanics.

Sources of Additional Information

More details about work opportunities may be obtained from automotive body repair shops and motor vehicle dealers; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also is a source of information about training programs.

For general information about automotive body repairer careers, write to:

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst, Ill. 60126.

For information on how to become a certified automotive body repairer, write to:

National Institute for Automotive Service Excellence, 1825 K St. NW., Washington, D.C. 20006.

For a directory of accredited private trade and technical schools that offer training programs in automotive body repair, write to:

National Association of Trade and Technical Schools, 2251 Wisconsin Ave. NW., Washington, D.C. 20007.

Diesel Mechanics

(D.O.T 620.281-046, -050, and -058; 623.281-018 and -026; and 625.261, .281-010 and -014, and .361)

Nature of the Work

Diesel engines usually are heavier and thus usually last longer than gasoline engines. In addition, they use fuel more efficiently than gasoline engines because the higher compression ratios found in diesel engines convert a higher percentage of the fuel into power. Because of their greater durability and efficiency, diesel engines are used to power most of the Nation's heavy vehicles and equipment.

Diesel mechanics repair and maintain diesel engines that power transportation equipment, such as heavy trucks, buses, and locomotives; and construction equipment such as bulldozers, cranes, and road graders. A small number work on diesel-powered automobiles. Diesel mechanics also service a variety of other diesel-powered equipment, such as electric generators and compressors and pumps used in oil well drilling and in irrigation.

Most diesel mechanics work on heavy trucks used in industries such as mining and construction to carry ore and building materials, and by commercial trucking lines for general freight hauling. Most light trucks are gasoline powered, and although some diesel mechanics service gasoline engines, most work primarily on diesel engines. For information on mechanics who work primarily on gasoline engines, see the *Handbook* statement on automotive and motorcycle mechanics.

Mechanics who work for organizations that maintain their own vehicles may spend much time doing preventive maintenance to assure safe operation, prevent wear and damage to parts, and reduce costly breakdowns. During a maintenance check on a truck, for example, they usually follow a regular check list that includes the inspection of brake systems, steering mechanisms, wheel bearings, and other important parts. They usually can repair or adjust a part that is not working properly. Parts that cannot be fixed are replaced.

In many shops, mechanics do all kinds of repair work. For example, they may work on a vehicle's electrical system one day and do major engine repair the next. In some large shops, mechanics specialize in one or two types of work. For example, one mechanic may specialize in major engine repair, another in transmission work, another in electrical systems, and yet another in suspension or brake systems.

Diesel mechanics use a variety of tools in their work. They use power tools such as pneumatic wrenches to remove bolts quickly; machine tools such as lathes and grinding machines to rebuild brakes and other parts; welding and flame-cutting equipment to remove and repair exhaust systems and other parts; common handtools such as screwdrivers, pliers, and wrenches to work on small parts and get at hard-to-reach places; and jacks and hoists to lift and move large parts. Diesel mechanics also use a variety of testing equipment. For example, when working on electrical systems, they may use ohmmeters, ammeters, and voltmeters; to locate engine malfunctions, they often use tachometers, dynamometers, and engine analyzers.

For heavy work, such as removing engines and transmissions, two mechanics may work as a team, or a mechanic may be assisted by an apprentice or helper. Mechanics generally get their assignments from shop supervisors or service managers who may check the mechanics' work or assist in diagnosing problems.

Working Conditions

Diesel mechanics usually work indoors, although they may occasionally work or make repairs on the road. They are subject to the usual shop hazards such as cuts and bruises. Mechanics handle greasy and dirty parts and may stand or lie in awkward or cramped positions to repair vehicles and equipment. Work areas usually are well lighted, heated, and ventilated, and many employers provide locker rooms and shower facilities.

Employment

Diesel mechanics held about 211,000 jobs in 1984. More than one-third worked for organizations that owned fleets of trucks, including construction and trucking companies and businesses that haul their own products, such as dairies and bakeries. Others worked for heavy truck dealers, dealers of diesel-powered light trucks and automobiles, truck repair shops, companies that rent or lease trucks, and Federal, State, and local govern-

Diesel mechanics use handtools to work on small parts and get at hard-to-reach places.

ments. About one-fifth worked for companies that sell and service construction and mining machinery and industrial equipment, such as compressors, pumps, and generators. A small number of diesel mechanics serviced buses for local transit companies and intercity buslines. Others maintained diesel locomotives for railroads.

Diesel mechanics are employed in every section of the country, but most work in towns and cities where trucking companies, buslines, and other fleet owners have large repair shops.

Training, Other Qualifications, and Advancement

Most diesel mechanics learn their skills on the job. Beginners usually do tasks such as cleaning parts, fueling, lubricating, and driving vehicles in and out of the shop. As beginners gain experience and as vacancies become available, they usually are promoted to mechanics' helpers. In some shops, beginners—especially those having automobile service experience—start as mechanics' helpers.

Most helpers can make minor repairs after a few months' experience and advance to increasingly difficult jobs as they prove their ability. After they master the repair and service of diesel engines, they learn to work on related components such as brakes, transmissions, or electrical systems. Generally, at least 3 to 4 years of on-the-job experience are necessary to qualify as an all-round diesel truck or bus mechanic. Additional training may be necessary for mechanics who wish to specialize in diesel equipment.

For entry jobs, employers generally look for applicants who have mechanical aptitude and are at least 18 years of age and in good physical condition. Completion of high school also is desirable. Good reading skills are needed to study complex service instruction manuals. A State chauffeur's license is needed for test driving trucks or buses on public roads.

Many employers prefer graduates of formal training programs in diesel mechanics. These 1- to 2-year programs, given by vocational and technical schools and community and junior colleges, lead to a certificate of completion or an associate degree. They provide a foundation in the basics of the latest diesel technology, such as the use of electronics, and speed advancement to the journeyman mechanic level.

A formal 4-year apprenticeship is another good way to learn diesel mechanics. While never plentiful, apprenticeships are becoming rare because employers are reluctant to make such a long-term investment in training, especially when graduates of postsecondary diesel mechanic programs are increasing in number. Typical apprenticeship programs for diesel truck and bus mechanics consist of approximately 8,000 hours of practical experience working on transmissions, engines, and other components and at least 576 hours of formal instruction to learn blueprint reading, mathematics, engine theory, and safety. Frequently, these programs include training in both diesel and gasoline engine repair.

High school auto shop and science and mathematics classes help a mechanic understand how engines and vehicles operate. Practical experience in automobile repair in a gasoline service station or the Armed Forces or from a hobby also is valuable.

Most mechanics must buy their own handtools. Experienced mechanics often have thousands of dollars invested in tools.

Employers sometimes send experienced mechanics to special training classes conducted by truck, bus, diesel engine, parts, and equipment manufacturers where they learn the latest technology or receive special training in subjects such as diagnosing engine malfunctions. Mechanics also must read service and repair manuals to keep abreast of engineering changes.

Voluntary certification by the National Institute for Automotive Service Excellence is recognized as a standard of achievement for diesel mechanics. Mechanics may be certified as Master Heavy-Duty Truck Technicians or may be certified in 1 or more of 6 different areas of heavy duty truck repair: Brakes, gasoline engines, diesel engines, drive trains, electrical systems, and suspension and steering. For certification in each area, mechanics must pass a written examination and have at least 2 years of experience. High school, vocational or trade school, or community or junior college training in gasoline or diesel engine repair may substitute for up to 1 year of experience. To retain certification, mechanics must retake the tests at least every 5 years.

Experienced mechanics who have leadership ability may advance to shop supervisors or service managers. Mechanics who have sales ability sometimes become sales representatives. A few mechanics open their own repair shops.

Job Outlook

Employment of diesel mechanics is expected to increase faster than the average for all occupations through the mid-1990's as freight transportation by truck increases. More trucks will be needed for both local and intercity hauling due to the increased production of goods. Additional diesel mechanics will be needed to repair and maintain growing numbers of buses and heavy construction graders, cranes, earthmovers, and other equipment. Due to the greater durability and economy of the diesel relative to the gasoline engine, buses and trucks of all sizes are expected to be increasingly powered by diesels, also creating new diesel mechanic jobs. The majority of job openings, nevertheless, will arise from the need to replace diesel mechanics who transfer to other occupations, retire, or stop working for other reasons.

Careers in diesel mechanics are attractive to many because wages are relatively high and skilled repair work is challenging and varied. Opportunities will be best for persons who complete formal training in diesel mechanics at community and junior colleges and vocational and technical schools.

Earnings

Diesel mechanics employed by trucking companies, buslines, and other firms that maintain their own vehicles had average hourly earnings of $11.93 in 1984. Earnings generally were highest in the West and North Central regions and lowest in the South. They varied by industry as follows:

Transportation	$12.40
Manufacturing	11.84
Retail trade	11.58
Wholesale trade	11.53
Services	10.32

Beginning apprentices usually earn one-half the rate of skilled workers and receive increases about every 6 months until they complete their apprenticeship and reach the rate of skilled mechanics.

Most mechanics work between 40 and 48 hours per week. Those employed by truck and bus firms which provide service around the clock may work evenings, nights, and weekends. They usually receive a higher rate of pay for this work.

Many diesel mechanics are members of labor unions, including the International Association of Machinists and Aerospace Workers; the Amalgamated Transit Union; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Transport Workers Union of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffers, Warehousemen and Helpers of America (Ind.).

Related Occupations

Diesel mechanics repair trucks, buses, and other diesel-powered equipment and keep them in good working order. Related mechanic occupations include aircraft mechanics, automotive and motorcycle mechanics, farm equipment mechanics, and mobile heavy equipment mechanics.

Sources of Additional Information

More details about work opportunities for diesel mechanics may be obtained from local employers such as trucking companies, truck dealers, or bus lines; locals of the unions previously mentioned; or the local office of the State employment service. Local State employment service offices also may have information about apprenticeships and other training programs.

For general information about careers as truck, bus, and diesel mechanics, write to:

American Trucking Associations, Inc., 2200 Mill Rd., Alexandria, Va. 22314.

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

International Association of Machinists and Aerospace Workers, Apprenticeship Department, 1300 Connecticut Ave. NW., Washington, D.C. 20036.

Motor Vehicle Manufacturers Association of the U.S., Inc., 300 New Center Bldg., Detroit, Mich. 48202.

Information on diesel mechanic training is available from:

Motor and Equipment Manufacturers Association, Technical Training Council, 222 Cedar Lane, Teaneck, N.J. 07666.

For a directory of accredited private trade and technical schools with training programs for diesel mechanics, contact:

National Association of Trade and Technical Schools, 2251 Wisconsin Ave. NW., Washington, D.C. 20007.

Information on how to become a certified heavy-duty diesel mechanic is available from:

National Institute for Automotive Service Excellence, 1825 K St. NW., Washington, D.C. 20006.

Farm Equipment Mechanics

(D.O.T. 624.281, .361-014, .381, .684, and 629.281-018)

Nature of the Work

Many years ago, farmers planted, cultivated, and harvested their crops using only handtools and simple, animal-drawn equipment. Few repairs were required, and if a stray rock or stump broke a plow blade, the metal pieces could be joined together by the local blacksmith. Even when tractors began to replace animals as the prime source of power, the early models were not very complicated and most farmers did their own repair work.

Farm equipment has grown enormously in size, complexity, and variety. Many farms have tractors equipped with 300-horsepower and larger diesel engines. Harvesting combines, hay balers, corn pickers, crop dryers, planters, tillage equipment, and elevators also are common. In today's world of large-scale, mechanized agriculture, few if any types of farming can be done economically without specialized machines.

As farm machinery grew more complex, it became important for the sellers of farm equipment to be able to service and repair the machines they sold. Almost every dealer employs farm equipment mechanics, often called service technicians, to do this work and to maintain and repair the smaller lawn and garden tractors many dealers sell to surburban homeowners.

In addition, some mechanics who work for dealers and equipment wholesalers assemble new implements and machinery and sometimes do body work, repairing dented or torn sheet metal on the tractors or other machinery.

Mechanics spend much of their time repairing and adjusting malfunctioning equipment that has been brought to the shop. But during planting and harvesting, they may travel to the farm to make emergency repairs on equipment so that critical farming operations are not unduly delayed.

Mechanics also perform preventive maintenance. Periodically, they test, adjust, and clean parts and tune engines. In large shops, mechanics may specialize in certain types of work, such as diesel engine overhaul, hydraulics, or clutch and transmission repair. Others specialize in repairing the air-conditioning units often included in the cabs of combines and large tractors, or in repairing certain types of equipment such as hay balers. Some mechanics also repair milking, irrigation, and other equipment on farms.

Mechanics use many basic handtools including wrenches, pliers, hammers, and screwdrivers. They also may use precision equipment such as micrometers and torque wrenches and engine testing equipment, such as dynamometers to measure engine performance, or compression testers to find worn piston rings or leaking cylinder valves. They may use welding equipment or power tools to repair broken parts.

Working Conditions

Generally, farm equipment mechanics work indoors. Modern farm equipment repair shops are well ventilated, lighted, and heated, but older shops may not offer these advantages. During planting and harvesting seasons, mechanics may make emergency repairs in the field, perhaps traveling many miles to do so. Farm equipment mechanics come in contact with grease, gasoline, rust, and dirt, and there is danger of injury when they repair heavy parts supported on jacks or by hoists. Care must also be used to avoid burns from hot engine parts, cuts from sharp edges of machinery, and injury from farm chemicals.

Employment

Farm equipment mechanics held about 18,000 jobs in 1984. Most worked in service departments of farm equipment dealers. Others worked in independent repair shops, in shops on large farms, and in service departments of retail lawn and garden supply stores. Most farm equipment mechanics work in small repair shops. About one-fifth of farm equipment mechanics are self-employed.

Because some type of farming is done in nearly every area of the United States, farm equipment mechanics are employed throughout the country. Employment is concentrated in small cities and towns, making this an attractive career choice for people who do not wish to live the fast-paced life of an urban environment. However, many mechanics work in the rural fringes of metropolitan areas, so farm equipment mechanics who prefer the conveniences of city life need not live in rural areas.

Training, Other Qualifications, and Advancement

Employers prefer applicants who have an aptitude for mechanical work. A farm background is an advantage since growing up on a farm usually provides experience in basic farm equipment repairs. Employers also prefer high school graduates, but some will hire applicants who have less education. In general, employers stress previous experience or training in diesel and gasoline engines, the maintenance and repair of hydraulics, and welding—subjects that may be learned in many high schools and vocational schools. Mechanics also must be able to read circuit diagrams and blueprints in order to make complex repairs to electrical and other systems.

Most farm equipment mechanics are hired as trainees and learn the trade on the job by assisting qualified mechanics. The length of training varies with the helper's aptitude and prior experience. At least 2 years of on-the-job training usually are necessary before a mechanic can do the more routine types of repair work, and additional training and experience are required for highly specialized repair and overhaul jobs.

Many farm equipment mechanics enter this occupation from a related occupation. For instance, they may gain experience as farmers and farm laborers, or as heavy equipment mechanics, automotive mechanics, or air-conditioning mechanics. People who enter from related occupations also may start as helpers, but they may not require a long period of on-the-job training.

With the development of more complex farm implements, technical training has become more important. A growing number of large employers prefer applicants who have completed 1 or 2 years of training in agricultural mechanics, including electronics, at a vocational or technical school or community or junior college.

A few farm equipment mechanics learn the trade by completing an apprenticeship program, which lasts from 3 to 4 years and includes on-the-job as well as classroom training in all phases of farm equipment repair and maintenance. Applicants for these programs usually are chosen from shop helpers.

Keeping abreast of changing farm equipment technology requires a great deal of careful study of service manuals and analysis of complex diagrams. Many farm equipment mechanics and trainees receive refresher training in short-term programs conducted by farm equipment manufacturers. These programs usually last several days. A

Farm equipment mechanics perform preventive maintenance and repair machinery.

company service representative explains the design and function of equipment and teaches maintenance and repair on new models of farm equipment. In addition, some dealers may send employees to local vocational schools that teach special weeklong classes in subjects such as air-conditioning repair or hydraulics.

Persons considering a career in this field should have the manual dexterity needed to handle tools and equipment. Occasionally, strength is required to lift, move, or hold heavy parts in place. Difficult repair jobs require problemsolving abilities to diagnose the source of the machine's malfunction. Experienced mechanics should be able to work independently with minimum supervision.

Farm equipment mechanics may advance to shop supervisor, service manager, or manager of a farm equipment dealership. Some mechanics open their own repair shops. A few farm equipment mechanics earn 2-year associate degrees in agricultural mechanics and advance to service representatives for farm equipment manufacturers.

Job Outlook

Employment of farm equipment mechanics is expected to increase more slowly than the average for all occupations through the mid-1990's. Most job openings will arise each year as experienced mechanics transfer to other occupations, retire, or stop working for other reasons. Opportunities will be best for persons with formal training in farm equipment repair or diesel mechanics and for applicants who have lived or worked on farms and know how to operate farm machinery and make minor repairs.

Continued consolidation of farm land into fewer and larger farms, requiring less farm equipment, is expected to restrict growth of farm equipment mechanic employment, particularly in farm equipment dealerships. On the other hand, a growing number of large farms are expected to employ their own mechanics. In general, the increasing technical sophistication of farm equipment will make it more difficult for farmers to do their own repairs, forcing them to rely more on skilled mechanics in the future. For instance, many newer tractors have much larger, electronically controlled engines and air-conditioned cabs, which have improved the comfort of the operator, and feature advanced transmissions with many speeds. New planting equipment uses electronics to spread seeds more uniformly, and electronic controls help harvesters reduce waste. Besides the development of larger and more complex farm machinery, sales of smaller lawn and garden equipment have increased vastly over the past decade and are expected to continue to do so. Most of the large manufacturers of farm equipment now offer a line of these smaller tractors and sell them through their established dealerships. Although relatively few mechanics service this equipment, more will be needed.

As with most agricultural occupations, the demand for farm equipment mechanics is highest during planting and harvesting seasons. During these busy periods, mechanics often work 6 or 7 days a week, 10 to 12 hours daily. In winter months, however, mechanics may work less than 40 hours a week and some may be laid off.

The agricultural equipment industry experiences periodic declines—mostly in sales. Layoffs of mechanics, however, are uncommon because farmers often elect to repair old equipment rather than purchase new equipment.

Earnings

Salaried farm equipment mechanics had median annual earnings of $15,100 in 1984, according to a national survey. The middle 50 percent earned between $11,700 and $19,100 a year. The highest salaries were paid to workers with the most experience and to those performing the most complicated repairs. In addition, higher salaries were paid in the heavily agricultural regions where competition is greatest for the more highly skilled mechanics. Most farm equipment mechanics also have the opportunity to work overtime during the planting and harvesting seasons, for which they generally are paid time and one-half.

Very few farm equipment mechanics belong to labor unions, but those who do are members of the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

Related Occupations

Other workers who repair large machinery include aircraft mechanics, automotive and motorcycle mechanics, diesel mechanics, and mobile heavy equipment mechanics.

Sources of Additional Information

Details about work opportunities may be obtained from local farm equipment dealers and local offices of the State employment service. For general information about the occupation, write to:

National Farm and Power Equipment Dealers Association, 10877 Watson Rd., St. Louis, Mo. 63127.

For general information on training, contact:

Motor and Equipment Manufacturers Association, Technical Training Council, 222 Cedar Lane, Teaneck, N.J. 07666.

Mobile Heavy Equipment Mechanics

(D.O.T. 620.261-022, .281-042, and .381-014)

Nature of the Work

Mobile heavy equipment is indispensable to construction, logging, surface mining, and other industrial activities. Mobile heavy equipment mechanics service and repair the engines, transmissions, hydraulics, electrical systems, and other components of equipment such as motor graders, trenchers and backhoes, crawler-loaders, and stripping and loading shovels. (Mechanics who specialize in servicing only diesel engines are discussed in the *Handbook* statement on diesel mechanics.)

Mobile heavy equipment mechanics perform routine maintenance on the diesel engines that power most heavy equipment, and, if an operator reports a malfunction, they search for its cause. First, they inspect and operate the equipment to diagnose the nature of the repairs required. They may partially dismantle the engine, examining parts for damage or excessive wear. Then they repair, replace, clean, and lubricate the parts as necessary, and reassemble and test the engine for operating efficiency. If repairs to the drive train are needed, mechanics may remove and repair the transmission or differential.

Many types of mobile heavy equipment use hydraulics to raise and lower movable parts such as scoops, shovels, log forks, or scraper blades. Repairing malfunctioning hydraulic components is an important responsibility of mobile heavy equipment mechanics. When the hydraulic apparatus loses power, mechanics examine it for hydraulic fluid leaks and replace ruptured hoses or worn gaskets on fluid reservoirs. Occasionally more extensive repairs are required, such as replacing a defective hydraulic pump.

Mobile heavy equipment mechanics perform a variety of other types of repairs. They diagnose and correct electrical problems and replace defective electronic components. They also may disassemble and repair crawler undercarriages and track assemblies. Occasionally mechanics may weld broken body and structural parts, using electric or gas welders.

Many mechanics work in small repair shops of construction contractors, logging and mining companies, and local government road maintenance departments. They typically perform routine maintenance and minor repairs necessary to keep the equipment in operation. Mechanics in larger repair shops—particularly those of mobile heavy equipment dealers and the Federal Government—perform more difficult repairs, such as rebuilding or replacing engines, repairing hydraulic fluid pumps, or correcting electrical problems. Mechanics in some large shops specialize in one or two types of work, such as hydraulics or electrical systems.

Repairing hydraulic components is an important responsibility of mobile heavy equipment mechanics.

Mobile heavy equipment mechanics use a variety of tools in their work. They use common handtools such as pliers, wrenches, and screwdrivers to work on small parts and get at hard-to-reach places. They use power tools such as pneumatic wrenches to remove bolts quickly, and jacks, hoists, and cranes to lift and move heavy parts. They use micrometers and gauges to measure wear on parts, and a variety of testing equipment. For example, they often use tachometers and dynamometers to locate engine malfunctions; when working on electrical systems, they may use ohmmeters, ammeters, and voltmeters.

Working Conditions

Most mobile heavy equipment repair shops are well ventilated, lighted, and heated. Mechanics work mostly indoors in shops, but field service mechanics spend much of their time away from the shop working outdoors. When mobile heavy equipment breaks down at a construction site, it is often too difficult or expensive to bring it into a repair shop, so a field service mechanic is sent to the job site to make repairs. Generally, the most experienced mobile heavy equipment mechanics specialize in field service, and they often must drive specially equipped trucks many miles to reach disabled machinery. For many mechanics, the independence and challenge of field work outweigh the occasional long hours or bad weather, but other mechanics are more comfortable with the routine of shop work and the opportunity to work as part of a team.

Mechanics handle greasy and dirty parts and often work in awkward or cramped positions. They frequently must lift heavy tools and parts. Mechanics are subject to burns, bruises, and cuts from hot engine parts and sharp edges of machinery. However, serious accidents may be avoided when the shop is kept clean and orderly and safety practices are observed.

Employment

Mobile heavy equipment mechanics held about 77,000 jobs in 1984. Over half worked for mobile heavy equipment dealers and Federal, State, and local governments. The Department of Defense is the primary Federal employer. Others worked for construction contractors, surface mine operators, and logging camps and contractors. Still others repaired equipment for machinery manufacturers, airlines, steel mills, utilities, and oil and gas field companies. About 1 out of 10 mobile heavy equipment mechanics was self-employed.

These mechanics are employed in every section of the country, but most work near cities and towns, where most construction takes place.

Training, Other Qualifications, and Advancement

For trainee jobs, employers hire persons with mechanical aptitude who are high school graduates at least 18 years of age. They seek persons knowledgeable about the fundamentals of diesel engines, transmissions, electrical systems, and hydraulics. Although some persons are able to acquire these skills through self study and working as helpers to experienced mechanics, most employers prefer graduates of formal training programs in diesel or heavy equipment mechanics.

Training programs in diesel and heavy equipment mechanics are given by vocational and technical schools and community and junior colleges. Some 1- to 2-year programs lead to a certificate of completion; others lead to an associate degree, if they are supplemented with additional academic courses. They provide a foundation in the basics of diesel and heavy equipment technology, including hydraulics, and speed advancement to the journeyman level. Training in the fundamentals of electronics is also an asset to mechanics because new mobile heavy equipment increasingly features electronic controls and sensing devices.

High school courses in automobile mechanics, physics, chemistry, and mathematics are a useful background. Good reading skills and a basic understanding of scientific principles can help a mechanic learn important job skills and keep abreast of new technology through the study of technical manuals. Experience working on engines in the Armed Forces or as a hobby also is valuable.

Persons who learn the basics of mobile heavy equipment mechanics largely on the job start as helpers—cleaning parts, lubricating, fueling equipment, cleaning up the shop.

Through the study of training and technical manuals and by observing and working with experienced mechanics, they may earn promotion to a trainee mechanic position.

Through a combination of formal and on-the-job training, trainee mechanics acquire the knowledge and skills to efficiently service and repair the particular types of equipment handled by the shop. Beginners are assigned relatively simple service and repair tasks. As they gain experience and become more familiar with the equipment, they are assigned increasingly difficult jobs, and are exposed to a greater variety of equipment.

Many employers send trainee mechanics to training sessions conducted by heavy equipment manufacturers. These sessions, which typically last up to a week, provide intensive instruction in the repair of a manufacturer's equipment. Some sessions focus on particular components found in all of the manufacturer's equipment, such as diesel engines and transmissions or electrical systems. Other sessions focus on particular types of equipment, such as crawler-loaders and crawler-dozers. As they progress, trainees may periodically attend additional training sessions. Experienced mechanics also occasionally attend training sessions to update their knowledge of new technology or to become familiar with types of equipment they may never have repaired.

Mobile heavy equipment mechanics usually must buy their own handtools, although employers furnish power tools and test equipment. Trainee mechanics are expected to accumulate their own tools as they gain experience. Many experienced mechanics have thousands of dollars invested in tools.

Experienced mechanics may advance to field service jobs, where they have greater opportunity to tackle problems independently and earn overtime pay. Mechanics who have leadership ability may become shop supervisors or service managers. Some mechanics open their own repair shops.

Job Outlook

Employment of mobile heavy equipment mechanics is expected to grow about as fast as the average for all occupations through the mid-1990's. Increasing numbers of mechanics will be required in repair shops of construction contractors and equipment dealers. Growing numbers of mechanics also will be needed by all levels of government to service construction equipment and, at the Federal level, defense-related equipment. Nevertheless, the majority of job openings will result from the need to replace mechanics who transfer to other occupations, retire, or leave the labor force for other reasons. Opportunities should generally be best for persons who have completed formal training programs in diesel or heavy equipment mechanics.

As the economy grows, growth of construction activity should result in more mobile heavy equipment requiring periodic service and repair. Various kinds of equipment will be needed in growing numbers to grade construction sites, excavate basements, lay water and sewer lines, and put in streets. In addition, construction of new highways and repair of existing ones will also require more mechanics.

Since construction and mining are sensitive to changes in the level of economic activity, mobile heavy equipment may be idled during downturns. In addition, winter is traditionally the slack season for construction activity, particularly in colder regions. Fewer mechanics may be needed during periods when equipment is used less intensively, but employers usually try to retain experienced workers. However, employers may be reluctant to hire inexperienced workers during slack periods.

Earnings

Median annual earnings of mobile heavy equipment mechanics were $21,300 in 1984. The middle 50 percent earned from $17,100 to $28,200 a year. The lowest 10 percent earned less than $12,300, while the top 10 percent earned over $34,300.

Some mobile heavy equipment mechanics are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union of Operating Engineers; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

Related Occupations

Workers in other occupations who repair and service diesel-powered vehicles and equipment include railcar repairers and diesel, farm equipment, and mine machinery mechanics.

Sources of Additional Information

More details about work opportunities for mobile heavy equipment mechanics may be obtained from local mobile heavy equipment dealers, construction contractors, surface mining companies, and government agencies. Local offices of the State employment service may also have information on work opportunities and training programs.

For general information about the work and training of mobile heavy equipment mechanics, contact:

Motor and Equipment Manufacturers Association, Technical Training Council, 222 Cedar Lane, Teaneck, N.J. 07666.

Electrical and Electronic Equipment Repairers

Electrical and electronic equipment is one of the hallmarks of our high-technology society. Electrical and electronic equipment repairers install, maintain, and repair this equipment. Many of them deal with highly complex telecommunications and computer equipment that is routinely used in factories, business offices, hospitals, schools, stores, ticket offices, and private homes. Others repair household appliances and home entertainment systems. A growing number of repairers work on the electronic components of industrial robots and numerical-control machine tools.

Mechanical aptitude and a knowledge of electrical theory are essential in these occupations. For many of them, some knowledge of advanced electronics theory and skill in the use of electronic testing equipment are also necessary.

At the entry level, some repairers may need only a high school diploma. They acquire specific job skills through on-the-job training, a formal apprenticeship, or an employer's training program. For many of these jobs, however, employers require formal training in electronics, which may be obtained in Armed Forces schools, vocational-technical institutes, community colleges, or private trade schools. Continuing education is important in this rapidly changing field, and many electronic equipment repairers periodically attend company-sponsored training sessions to learn about new technological advances and to sharpen their repair skills.

This section of the *Handbook* describes seven repair occupations: Commercial and industrial electronic equipment repairers, communications equipment mechanics, data processing equipment repairers, electronic home entertainment equipment repairers, home appliance and power tool repairers, line installers and cable splicers, and telephone installers and repairers.

Commercial and Industrial Electronic Equipment Repairers

(D.O.T. 726.381-014, 828.251-010, .261-010, -014, and -022)

Nature of the Work

Commercial and industrial electronic equipment repairers, also called electronics mechanics, install and repair electronic equipment used in industrial automated equipment controls, missile control systems, radar systems, X-ray equipment, transmitters, and antennas. (Workers who repair data processing equipment and home entertainment equipment are discussed elsewhere in the *Handbook*.)

Commercial and industrial electronics mechanics install the electronic components of new equipment. Duties vary by industry setting. On an Air Force base, for example, they may install the electronic control panel on a new fighter plane. In a hospital, the work might involve installing computer-assisted topography (CAT Scan) equipment. Regardless of the type of equipment, repairers must coordinate their efforts with workers installing mechanical or electromechanical components. Using testing equipment, the repairer insures that everything is functioning properly before the customer takes charge of the equipment.

When trouble occurs in the equipment, the repairer first determines that it is in the electronic component of the equipment and checks for common causes of trouble such as loose connections or obviously defective components. If routine checks do not locate the trouble, repairers refer to blueprints and manufacturers' specifications that show connections and provide instruction on how to locate problems.

When locating the cause of electronic failures, repairers use several kinds of tools including voltmeters, ohmmeters, signal generators, ammeters, and oscilloscopes. They run special diagnostic programs that help pinpoint certain malfunctions. To make repairs, they may replace defective components or wiring, or adjust and calibrate equipment. Although it may take several hours to locate a problem, fixing the equipment may take only a few minutes.

Preventive maintenance is another responsibility of electronics repairers. Equipment is checked, cleaned, and repaired periodically to detect and prevent defects. Records are usually kept to show the date and condition of the equipment serviced, and to indicate when it is due to be reserviced. Repairers also have to maintain records of repairs, calibration, and tests.

Working Conditions

Commercial and industrial electronic equipment repairers generally work a 40-hour week. Industries that operate around the clock will often rotate shifts, so repairers may work evenings, nights, days, weekends, or holidays. For example, repairers working for hospitals may have to work evenings and weekends so that someone is always available to make emergency repairs to malfunctioning respirators and other life-support equipment. In less critical situations, electronics repairers employed as part of an emergency crew may be on call during off-duty hours.

Working conditions vary depending upon the job. On the factory floor, repairers may be exposed to heat, grease, and noise, and may have to work in cramped spaces. Sometimes the work is done in the electronic repair shop, which is generally located off the factory floor. Here, as well as in hospitals, military installations, and other job settings, the surroundings usually are quiet, clean, and well lighted. Electronics repairers usually work with little supervision.

Employment in manufacturing establishments generally entails considerable walking, kneeling, bending, and reaching to install or repair equipment.

Employment

Electronics repairers held about 56,000 jobs in 1984. About 4 out of 10 repairers are employed by the Federal Government; the overwhelming majority of these work for the Department of Defense—mostly at military installations around the country.

Repairers are also employed by electronic and transportation equipment manufacturers, airports, telephone companies, and hospitals. Metropolitan areas where large numbers of repairers are located include Los Angeles, Chicago, New York, Philadelphia, Newark, Boston, Baltimore, Indianapolis, and Dallas.

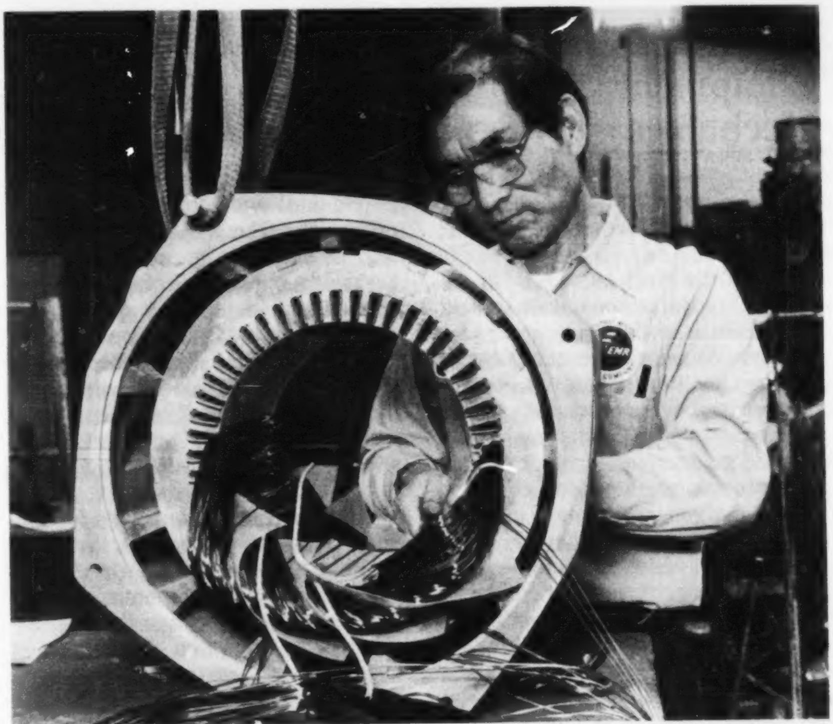
Training, Other Qualifications, and Advancement

Commercial and industrial electronic equipment repairers need training in the practical application of electronics. Required courses include electronics theory and technology, preventive maintenance, and troubleshooting techniques. Most repairers attend either a public, private, or Armed Forces technical school. Some receive training through a 3- or 4-year apprenticeship program administered by employers. High school graduates who have had courses in mathematics and science are preferred for the apprenticeship program.

Electronics repairers need good color vision, manual dexterity, and good eye-hand coordination. They should have an aptitude for mathematics and be able to do detailed work. Other qualifications include a good memory, recordkeeping ability, the ability to do repetitive tasks, and physical strength.

Repairers who test and repair radio transmitting equipment, other than business and land mobile radio, must hold a General Operators License from the Federal Communications Commission.

There is also a voluntary program for the testing and certification of repairers administered by the International Society of Certified Electronics Technicians (ISCET). An electronics repairer with 4 years' experience may apply for certification as a Certified Electronics Technician (CET). Certification, which is by examination, is offered in radio-TV, industrial and commercial repair, audio, and radar systems. There is also an Associate Level Test of basic electronics available for students or beginning repairers who do not have the experience required for full certification.



Preventive maintenance is part of the work of commercial and industrial electronic equipment repairers.

Some workers advance to electronics technicians or engineering assistants. Opportunities for advancement are improved by taking courses offered by employers, junior colleges, or technical schools.

Job Outlook

Employment of commercial and industrial electronic equipment repairers is expected to increase about as fast as average for all occupations through the mid-1990's as business and industry install more equipment to automate production processes. In addition, electronic equipment used in national defense, medicine, and energy conservation will greatly stimulate demand for skilled repairers. Many job openings also will result from the need to replace workers who transfer to other occupations, retire, or leave the occupation for other reasons.

Earnings

Beginning commercial and industrial electronic equipment repairers started at between $12,500 and $13,500 a year in 1984, according to the limited information available. Experienced repairers earned from $25,000 to $31,000, while highly skilled specialists who can work on more than one type of equipment earned as much as $37,500.

Average annual salaries of repairers who were employed by the Federal Government in 1985 were $26,381.

Related Occupations

Other occupations in which workers repair electronic equipment include home appliance and power tool repairers, office machine and cash register servicers, computer service technicians, and electronic home entertainment equipment repairers.

Sources of Additional Information

For career and certification information, contact:

The International Society of Certified Electronics Technicians, 2708 West Berry St., Fort Worth, Texas 76109.

For certification, career, and placement information, contact:

Electronics Technicians Association, 825 East Franklin, Greencastle, Ind. 46135.

Communications Equipment Mechanics

(D.O.T. 722.281; 726.381-014; 822.261-010, .281-010, -014, -022, -026, -030 and -034, .361-014, .381-010, -018, -022, and .684-010; 823.261-010 and -018, .281-010, -014, and -022; 825.261-010; and 829.281-022)

Nature of the Work

The ability to communicate quickly and easily is a necessity in modern society. Because communication is vital to a healthy economy, it is essential that the communications system operate properly. Installing, repairing, and maintaining the wide array of complex and sophisticated communications equipment are the responsibilities of communications equipment mechanics. Most communications equipment mechanics work either in telephone company central offices or on customers' premises installing and repairing complex telephone switching and transmission systems.

Central office equipment installers, or equipment installation technicians, set up, rearrange, and remove the complex switching and dialing equipment used in central offices. They install equipment in new central offices, add equipment in expanding offices, or replace outdated equipment.

Installers follow work order information, blueprints, circuit diagrams, electrical schematics, and floor plans to position and wire equipment. They often use hoists to lift heavy items, and handtools, such as screwdrivers or soldering guns, to connect equipment once it is in place. For example, they construct and erect iron and steel frames and connect these to the central office equipment. The newer electronic equipment, however, comes in preassembled components and often requires only simple plug-in connections.

After the new equipment has been put in place, installers connect the outgoing and incoming telephone trunklines, consulting diagrams to insure that connections are made correctly. Once this is completed, installers test and troubleshoot the system to see that everything is working correctly. They use communication testing equipment, such as pulsing test sets, oscilloscopes, ohmmeters, and voltmeters, to measure the strength and consistency of the current flow. If the system is not functioning properly, they must determine the cause of the difficulty and correct the malfunction.

Frame wirers, sometimes referred to as frame workers or frame attendants, connect, disconnect, inspect, and repair wires that run from telephone lines and cables to the central office. The frame has many terminal lugs mounted on it, each of which is assigned a specific telephone number. It also contains one pair of wires for each telephone that is connected to that central office. To connect a new telephone, the frame wirer attaches the customer's pair of wires to a set of terminal lugs, using small handtools, such as pliers, screwdrivers, and soldering irons. To disconnect a telephone, the frame wirer melts the solder or otherwise removes the wires from the terminal. Frame wirers occasionally change a customer's phone number by reconnecting the customer's pair of wires to a different set of terminal lugs. Frame wirers inspect and repair all parts of the frames after checking for breaks or loose wires. They also may help other craft workers locate and correct malfunctions. To gain experience, frame wirers generally work on residential telephone service. Later, they may work on more complex special services, such as circuitry for large business systems, civil defense warning sirens, or burglar alarms.

Central office repairers, often referred to as central office technicians or switching equipment technicians, test, repair, and maintain all types of local and toll switching equipment that automatically connects lines when customers dial numbers. Most of these switching systems are electromechanical—that is, they contain moving parts and must be cleaned and oiled periodically. Newer switching systems, which utilize digital electronics and have no moving parts, must be checked occasionally for breakages.

When customers report trouble with their telephones, *trouble locators* work at special switchboards—sometimes called testboards—to find the source of the problem. To do this, they have the telephone repairer connect a portable phone at various places on the customer's line until a connection can be made to the central office. For a problem at the central office, the trouble locator repeats this procedure with a central office repairer. Trouble locators who work for cable television companies must insure that subscribers' television sets receive the proper signal. They may work with cable installers to track down the cause of the interference and make repairs.

Within the last few years, most telephone companies have started replacing trouble locators with *maintenance administrators*. These workers perform many of the functions of trouble locators but generally do not have as much technical training. Their jobs are largely automated; instead of using testboards and associated equipment to perform the complex circuit testing, they do so by entering instructions into a computer terminal. Maintenance administrators also update and maintain computerized files of trouble status reports.

PBX installers, also called systems technicians, specialize in complex telephone system installations. These workers create switchboard systems for businesses with unique communications requirements. PBX and other systems are used to transmit both voice and data. Using equipment that includes handtools, signal generators, ohmmeters, oscilloscopes, and other specialized telephone test equipment, these workers connect wires from terminals to switchboards and power cabinets and make tests to check their installations.

PBX repairers, with the assistance of trouble locators, locate the malfunction in customers' PBX, CENTREX, KEY, or other telephone systems and make the necessary repairs. They also maintain associated equipment such as batteries, relays, and powerplants. Some PBX repairers maintain and repair equipment for mobile radiophones, microwave transmission equipment, switching equipment, and data processing equipment.

Other communications equipment mechanics include *instrument repairers*, sometimes referred to as shop repairers or shop technicians, who use handtools and power tools to repair, test, and modify communications equipment such as telephones, teletypewriters, and switchboards. In addition, they may paint various types of equipment and cut and weld iron for special work equipment. *Office electricians* make operating adjustments in submarine cable repeater and terminal circuits and related equipment. When trouble arises, they may rearrange cable connections to insure that service is not interrupted. *Submarine cable equipment technicians* repair, adjust, and maintain the machines and equipment used in submarine cable offices or stations to control cable traffic. Some mechanics specialize in working on telegraphic equipment. Called *automatic equipment technicians*, *telegraph plant maintainers*, or *teletype installers*, these workers install, repair, and maintain a variety of transmitting and receiving equipment in telegraph company offices and on customers' premises.

Radio repairers and mechanics install and repair stationary and mobile radio transmitting and receiving equipment. Some of these workers repair intercommunication equipment such as microwave and fiber optics installations. *Avionics technicians* inspect and repair aircraft communication, navigation, and flight control systems. *Signal or track switch maintainers* install electric gate crossings, signals, track switches, and intercommunication systems in a railroad network.

Working Conditions

Because most communications systems operate 24 hours a day, 7 days a week, many communications equipment mechanics have work schedules that include shifts, weekends, and holidays. Where shift work is required, the assignments are made on the basis of seniority. To cope with any emergency that may arise, these workers are subject to 24-hour call. Mechanics generally work in clean, well-lighted, air-conditioned surroundings. Depending on the job, they may have to stand for long periods, climb ladders, and do some reaching, stooping, and light lifting. Some wear headsets most of the time and communicate constantly over telephone circuits with others. Because much of the older communications equipment continually produces sounds, these workers must learn to "block out" noise.

Employment

Communications equipment mechanics held about 73,000 jobs in 1984. Most worked for telephone and telegraph companies. A small number worked for cable television and related companies.

Training, Other Qualifications, and Advancement

Requirements vary by employer. Preference in filling mechanic jobs generally is given to employees already with the company, such as operators, clerical workers, or line installers. Occasionally, trainees are hired from outside the company. Employees not presently in a craft position and those persons seeking employment from outside may be required to take qualification exams. These exams usually test the applicant's arithmetic, verbal, and abstract reasoning skills. In addition, driving may be necessary. If so, a valid State driver's license and a good driving record are required. Physical examinations also are generally required.

Because wires are usually color coded, persons who are considering a job as a communications equipment mechanic must be able to distinguish colors. Physical strength and agility are needed for carrying equipment and climbing and working from ladders. In addition to manual dexterity (to work with small tools), applicants should have the analytical skills and judgment to resolve mechanical difficulties. Self-discipline is needed to follow detailed instructions without close supervision. Prospective workers should be able to work as part of a team, since cooperation with others often is essential in solving complex problems. Reading comprehension, logic, and arithmetic ability are required in understanding company manuals and circuit wiring diagrams. Verbal skills are needed for those jobs that require contact with the public and coordination of activities with other employees. A basic knowledge of electricity and electronics and telephone training in the Armed Forces are helpful. Experience in data systems technology or computer maintenance is valuable for work with electronic switching systems.

Trainees generally begin as frame wirers. This is an entry level job, and there are no set educational requirements. Although local hiring practices vary, many companies do not require a high school diploma. The ability to read and understand company manuals and work orders is important, however. New workers receive about 6 months of classroom instruction and on-the-job training. Within the past few years, some telephone companies have started to use modular training programs to supplement the more traditional methods of training. Modular training programs include entry tests, videotapes, movies, computer terminals, programmed workbooks that allow employees to learn new skills at their own pace, and tests upon completion of training. Trainees gain practical experience by observing and helping experienced frame wirers. Af-

Repairing communications equipment requires good hand-eye coordination and close attention to detail.

ter 1 or 2 years of satisfactory performance, frame wirers may be selected to train for a more skilled job, such as trouble locator, central office repairer, or instrument repairer.

The more demanding repair jobs sometimes are filled by entry workers who have previous electrical or electronic experience. More often, however, trainees come from the ranks of the company's frame wirers, telephone installer-repairers, or line installer-repairers. Depending upon the complexity of the equipment to be maintained, companies provide up to 7 months of initial classroom instruction, followed by a lengthy period of on-the-job training. Communications equipment mechanics must continue to study throughout their careers. For example, they return to the classroom from time to time to learn about new types of equipment, which may include electronic switching systems, data transmission equipment, and picturephones.

These workers have a number of opportunities for advancement, which usually involve further technical training. They may be promoted to jobs maintaining more sophisticated equipment, or to jobs as engineering technicians. Some advance to sales or personnel work.

Job Outlook

Employment of communications equipment mechanics is expected to grow more slowly than the average for all occupations through the mid-1990's. Nevertheless, many job openings will arise each year as experienced workers transfer to other occupations, retire, or leave the occupation for other reasons.

Employment will be subject to conflicting trends through the period. On the one hand, technological advances that have made possible new telecommunications services will stimulate the demand for workers to install switching and transmission equipment in new central offices and control centers. In addition, conversion of older, electromechanical central offices and toll centers to digital electronic switching centers is expected to continue. However, once these systems are installed, fewer service technicians will be needed for maintenance and repair. Advances in mobile telephones and other specialized communications services such as teleconferencing, airline telephone service, electronic banking, digital paging, teletext, videotex, electronic mail, and simultaneous transmission of voice and data over the same channel will generate demand for PBX installers and repairers. Deregulation of the telephone industry, along with increasing competition, will continue to allow more firms to build long-distance communications networks that utilize central office equipment. The expansion of cable television systems also will stimulate demand for skilled workers.

Conversion to electronic switching requires fewer installers because much of this equipment is prefabricated and therefore is easier to install. It also permits a greater use of centralized maintenance. As telephone companies use more computer-based support programs to automate central offices, maintenance and repair personnel can be stationed at various control centers. Mobile crews of repairers then can provide the necessary modifications by rotating among several automated central offices. Considerably fewer maintenance and repair workers will be needed with centralized maintenance. Moreover, these new electronically equipped central offices use sophisticated, self-diagnosing test equipment that requires fewer repair and maintenance personnel.

Labor-management cooperation in minimizing the adverse effects of technological change is well established in the telephone industry. The planned use of attrition is a major technique for reducing employment. In addition, unneeded workers are being retrained and transferred to other jobs or localities.

Earnings

Wage rates for communications equipment mechanics vary by employer and locality. In 1984, median hourly earnings for these workers were about $11.60. The middle 50 percent earned between $8.90 and $14.20. The bottom 10 percent earned less than $6; the top 10 percent earned more than $16.70. Central office telephone craft workers and PBX installers and repairers usually earn more than most other communications equipment mechanics. Earnings for experienced telephone craft workers represented by the Communications Workers of America ranged from $11.25 to $15.50 an hour.

Most communications equipment mechanics are members of the Communications Workers of America, the International Brotherhood of Electrical Workers, or the Telecommunications International Union. For these workers, union contracts determine wage rates, wage increases, and the time needed to advance from one step to the next. Contracts also require extra pay for work beyond the normal 8 hours a day or 5 days a week, and for all work on Sundays and holidays. Additional pay for nightwork is provided for in most contracts. Paid vacations are based on time in service. Generally, contracts provide for a 1-week vacation beginning with 6 months of service; 2 weeks for 1 to 6 years; 3 weeks for 7 to 14 years; 4 weeks for 15 to 24 years; and 5 weeks for 25 years and over. Depending on the locality, holidays range from 9 to 12 days a year. Other contract provisions include the following: Paid sick leave; group life, medical, and dental insurance; vision care; sickness and accident benefits; educational benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

Related Occupations

Other workers who have the skills needed to do technical, manual work with tools and electrical or electronic machines include computer service technicians, office machine repairers, biomedical equipment technicians, electronics technicians, electricians, telecommunications technicians, and sound technicians.

Sources of Additional Information

For more details about employment opportunities, contact your local telephone or telegraph company or write to:

Communications Workers of America, 1925 K St. NW., Washington, D.C. 20006.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Telecommunications International Union, 2341 Whitney Ave., Hamden, Conn. 06518.

For more information on the telephone industry and career opportunities in it, request copies of *Phonefacts* and *Is It For You? A Career in the Telephone Industry* from:

United States Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

Computer Service Technicians

(D.O.T. 633.261-010, 828.261-014, .281-010, and -014)

Nature of the Work

Computer systems play a vital role in our lives. They help us make telephone calls, receive paychecks on time, and reserve hotel rooms and tickets for travel and entertainment. In business and industry, computer systems perform countless tasks—from maintaining business records to controlling manufacturing processes.

A computer system consists of a computer and peripheral equipment, such as remote terminals, tape and disk storage units, and high-speed printers. Systems vary in size from desktop systems consisting of a microcomputer, disk drive, and printer to large mainframe systems that occupy entire floors of office buildings and may have terminals in locations miles from the computer. Keeping this intricate equipment in good working order is the job of the computer service technician.

Most computer service technicians are assigned several clients, depending on the technician's specialty and the type of equipment to be serviced. Workers with several accounts must travel from place to place to maintain these systems and to make emergency repairs. In some cases, more than one technician will share an account and service different parts of a system. In other cases, an experienced technician may be assigned to work full time at a client's installation in order to maintain all phases of that operation. Some technicians work in central facilities where equipment or components are brought for service.

At regular intervals, computer service technicians (often called field engineers or customer engineers) service the equipment according to manufacturer's recommended maintenance schedules. For example, they routinely adjust, oil, and clean mechanical parts of printers and sorters.

When computer equipment breaks down, technicians must quickly find the cause of the failure and make repairs. To locate the cause of failures, technicians run special diagnostic programs that pinpoint malfunctions. Fixing the equipment may take just a few minutes because most repairs merely involve the replacement of malfunctioning components. To correct an electronic problem, for example, the technician would replace the circuit board indicated by the diagnostic program. In some cases, technicians simply give the customer a new piece of equipment and take the malfunctioning one to a central facility for service.

Computer service technicians also install new equipment. They lay cables, hook up electrical connections between machines, thoroughly test the new equipment, and correct any problems before the customer uses the machine.

Some technicians specialize in maintaining a particular brand or type of equipment or system, or in doing a certain type of repair. For example, some technicians are experts in correcting problems caused by errors in the computer's internal programming.

Computer technicians must be familiar with technical manuals and diagnostic programs for each piece of equipment. They also must keep up with the technical information and revised maintenance procedures issued periodically by equipment manufacturers. To repair mechanical parts, repairers use a variety of handtools, including needle-nosed pliers, wirestrippers, and soldering equipment. The employer supplies tools and test equipment, but technicians are responsible for keeping them in good working order.

Technicians keep a record of preventive maintenance and repairs on each machine they service. In addition, they fill out time and expense reports, keep parts inventories, and order parts.

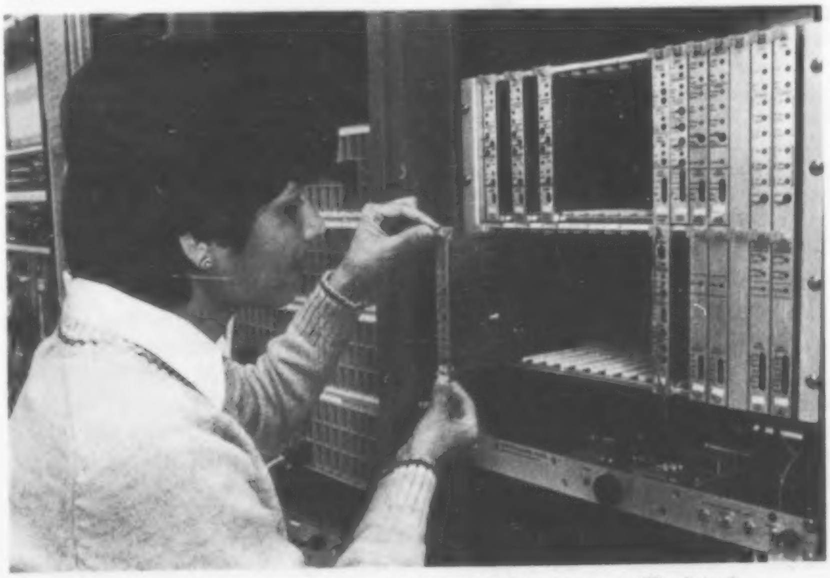
Technicians spend much of their time working with people. They listen to customers' complaints, answer questions, and sometimes offer technical advice on ways to keep equipment in good condition. In many ways, technicians act as public relations workers for their employer, promoting customer satisfaction and good will. In addition, experienced technicians often help train new workers and sometimes have limited supervisory duties.

Working Conditions

The normal workweek for technicians is 40 hours. Many users of computer systems, however, rely on their equipment around the clock, and working time lost because of a breakdown can be very expensive. For this reason, technicians must be available to make emergency repairs at any time, day or night. Although overtime is commonplace, the method of assigning overtime varies by employer. Some technicians are on call 24 hours a day, others work rotating shifts—days one week, nights the next.

Although some bending and lifting are necessary, the job is not strenuous. Work hazards are limited mainly to minor burns and electric shock, but these can be avoided if safety practices are followed.

For most technicians, travel is local; they usually are not away from



Determining the source of a malfunction is the technician's most difficult task.

home overnight. Employers pay for travel, including reimbursement for job-related use of the technician's car. In some cases, employers provide a car for the technician's use. Technicians who work for a nationwide organization must sometimes transfer to another city or State.

Employment

Computer service technicians held about 50,000 jobs in 1984. Most are employed by wholesalers and manufacturers of computer equipment and by firms that provide maintenance services for a fee. A small number are employed directly by organizations that have a great deal of computer equipment. Computer technicians generally work in metropolitan areas where computer equipment is concentrated.

Training, Other Qualifications, and Advancement

Most employers require applicants for technician jobs to have 1 to 2 years' post-high school training in basic electronics, data processing equipment maintenance, or electrical engineering. This training may be from a public or private vocational school or a college or university. Basic electronics training offered by the Armed Forces and by some vocational high schools also is acceptable preparation for some jobs. Many entrants transfer from other occupations, such as office machine repairer, television service technician, and engineering technician, where a knowledge of electronic equipment provides a good background for work in this field.

A high school student interested in becoming a computer service technician should take courses in mathematics and physics. High school courses in electronics and computer programming also are helpful.

Besides technical training, applicants for trainee jobs must have good vision and normal color perception to work with small parts and color-coded wiring. Because technicians usually handle jobs alone, they must have the initiative to work without close supervision. Also important are a pleasant personality and neat appearance, since the work involves frequent contact with customers. Patience is an asset, because some malfunctions occur intermittently, making the cause difficult to pinpoint. In some companies, applicants must pass a physical examination. A security clearance may be required in cases where technicians regularly service machines located in restricted buildings, such as Federal Government installations engaged in classified activities.

Newly hired technicians usually receive 3 to 6 months of training from their employer. They may study elementary computer theory, computer math, and circuitry theory in addition to expanding their knowledge of basic electronics. This training includes hands-on experience with computer equipment, doing basic maintenance, and using diagnostic programs to locate malfunctions.

In addition to formal instruction, trainees must complete 6 months to 2 years of on-the-job training. At first, they work closely with experienced technicians, learning to maintain machines that are relatively simple. Some companies have trainees gain experience by specializing in a certain type of equipment for a time. When trainees have mastered repair of that device they specialize in another. This process continues until the technician can work with a variety of equipment.

Because manufacturers continually redesign equipment and develop new service procedures, experienced technicians must attend training sessions to keep up with these changes and to broaden their technical skills. Many technicians take advanced training to specialize in a particular computer system or type of repair. Instruction also may include programming, systems analysis, and other subjects that improve the technician's general knowledge of the computer field.

Experienced technicians with advanced training may become specialists or troubleshooters who help technicians throughout their territory diagnose difficult problems. They also may work with engineers in designing equipment and developing maintenance procedures. Those with leadership ability may become supervisors or service managers.

Experience in computer maintenance when combined with additional education may also help qualify a technician for a job in equipment sales, programming, or management. (See the statements on programmers and manufacturers' sales workers elsewhere in the *Handbook*.)

Job Outlook

Employment of computer technicians is expected to grow much faster than the average for all occupations through the mid-1990's. As the Nation's economy expands, more computer equipment will be used, and more technicians will be needed to install and maintain it. Business, government, and other organizations will buy equipment to manage vast amounts of information, control manufacturing processes, and aid in scientific research. The development of new uses for computers also will spur demand.

Employment of service technicians is expect to grow more slowly than the amount of equipment in use due to improvements that make it more reliable and easier to repair. For example, the latest equipment can diagnose the cause of its own malfunctions. For some computer equipment, the diagnosis of the malfunction will be done by another computer via telephone hookup. As computer equipment becomes smaller and more portable, more of the diagnosis and repair will be done in centralized repair facilities, lessening the time spent traveling to job sites. These factors will lessen the time needed to make repairs and should limit somewhat the rise in employment.

Despite the faster than average growth in employment, most job openings for technicians will result from the need to replace workers who transfer to other occupations such as service manager, or who leave the labor force.

Computer service technicians have been less likely than other workers to be laid off during downturns in economic activity. However, firms do restrict hiring of new technicians during recessions, making it harder to enter the occupation. Technicians experienced in the service of several models and brands of equipment or with the most complex equipment generally will be in the greatest demand.

Earnings

Median weekly earnings of full-time computer service technicians were about $480 in 1984. The middle 50 percent earned between $375 and $625. The lowest 10 percent earned less than $270 a week. Many of these probably were trainees. The top 10 percent of technicians earned over $740 a week.

Related Occupations

Workers in other occupations who repair and maintain the circuits and mechanical parts of electronic equipment include appliance repairers, automotive electricians, electronic organ technicians, instrument repairers, office machine repairers, radio repairers, radar mechanics, and television service technicians.

Sources of Additional Information

For general information on careers in computer maintenance, contact the personnel department of computer manufacturers and computer maintenance firms in your area. The State department of education in your State capital can furnish information about approved technical institutes, junior colleges, and other institutions offering postsecondary training in basic electronics.

The State employment service office in your area also may be able to provide information about local job opportunities.

Electronic Home Entertainment Equipment Repairers

(D.O.T. 720.281, 729.281-010, 726.381-014, 730.281-018, 823.361-010, and 828.261-010)

Nature of the Work

Electronic home entertainment equipment repairers, also called service technicians, repair a wide range of home electronic products, of which radios and television sets are the most numerous. Stereo components, video and audio tape recorders, video games and disk players, home computers, home security systems, and even electronic organs are repaired by these technicians. Some repairers specialize in one kind of equipment—for example, television sets or car radios. Others repair several types—television sets, video cassette recorders, intercoms, and public address systems.

Electronic equipment may fail to operate properly for many reasons, such as wornout or defective parts, faulty circuits, or poor connections. Service technicians first conduct a routine check for these common causes of trouble. Talking to customers may help technicians identify the problem.

When routine checks do not locate the trouble, technicians refer to wiring diagrams and service manuals that show connections and provide instructions on how to locate problems. They check circuits using testing equipment, such as voltmeters, oscilloscopes, signal generators, and frequency counters. For example, they may measure voltage or wave forms in the circuits of a television set for unusual or irregular measurements that indicate the trouble. To make repairs, technicians replace faulty parts or make adjustments, such as focusing and converging the picture or correcting the color balance of a television set. In their work, technicians use pliers, soldering irons, wire cutters, and other handtools. Technicians who make customer service calls carry a variety of solid-state components, modules, and other parts that can be easily replaced in the customer's home.

Self-employed electronic home entertainment equipment repairers have managerial responsibilities in addition to their regular duties. They have to order equipment and supplies, keep records, and supervise other technicians.

Working Conditions

Service technicians work in shops and sometimes customers' homes, where working conditions generally are good. They usually work alone and receive little supervision. Technicians who service electronic products in homes may do considerable driving. Potential hazards include electrical shock and strains from lifting and carrying.

Service technicians generally work 40 to 44 hours per week, usually in 5 or 5 1/2 days. Some of this work may be conducted on weekends or evenings in order to better serve customers.

Employment

Electronic home entertainment equipment repairers held about 52,000 jobs in 1984. Nearly one-fourth were self-employed, a larger proportion than in most skilled trades. Most service technicians, whether self-employed or working for others, worked in television repair shops and stores that sell and service television sets, radios, and other home entertainment electronic products.

Geographically, employment is distributed in much the same way as population.

Training, Other Qualifications, and Advancement

Training in electronics—acquired formally or through on-the-job training in another, related occupation—generally is required to get an entry level job as an electronic home entertainment equipment repairer. The military services also offer training and work experience that are very useful in civilian electronics work.

Service technicians who work in large repair shops may be promoted to supervisor or service manager.

Formal training is offered by high schools, private vocational schools, and junior colleges. Programs in these schools include subjects such as mathematics, physics, schematic reading, electricity, and hands-on work with television sets, radios, and other electronic equipment. The training lasts from 1 to 2 years. Additional training in radio and television electronics generally is required by employers.

A few repairers complete formal apprenticeship programs that are sponsored jointly by locals of the International Brotherhood of Electrical Workers and employers.

New repairers usually begin by working in the shop or in the field under the supervision of an experienced worker. Large repair stores may provide in-house training combined with home study to familiarize new workers with particular brands and models of equipment.

Service technicians must keep abreast of changes in technology. Manufacturers, employers, and trade associations conduct training seminars to teach technicians how to service new models or products. Technicians also keep up with developments by studying manufacturers' service manuals and technical magazines.

Electronic home entertainment equipment repairers must be able to manipulate small parts and tools, and must have good eye-hand coordination, normal hearing, and good eyesight and color perception. Courtesy and tact are essential in dealing with customers.

Some States require repairers to be licensed. To obtain a license, applicants must pass an examination designed to test their knowledge of electronic circuits and components and their skill in the use of testing equipment.

Service technicians who work in large repair shops may be promoted to supervisor or service manager. Those interested in advancing to positions such as electronics "troubleshooters" can improve their opportunities by taking courses in automatic controls, electronic engineering, television engineering, and mathematics.

Technicians who have sufficient funds may open their own service shops. Those planning to go into business for themselves should take some business administration courses, particularly accounting and consumer relations.

Job Outlook

Employment of electronic home entertainment equipment repairers is expected to increase about as fast as the average for all occupations through the mid-1990's in response to the growing number of television sets, video games, disk players, radios, phonographs, tape recorders, and other home entertainment products. Population growth and rising personal incomes will contribute to the demand. Closed-circuit television, which is being used increasingly to monitor production processes in manufacturing plants, to provide security surveillance in buildings, and to bring educational programs into classrooms, will create additional demand for service technicians. Continuous improvements in solid-state technology have reduced service requirements, however, which will keep employment from rising as fast as otherwise would be expected.

Despite the rising demand for these workers, the need to replace workers who leave the occupation will account for most job openings. Because experience in commercial and industrial electronic repair is good preparation for other jobs such as office machine and cash register servicer, computer service technician, and broadcast technician, an unusually large proportion of radio and television service technicians transfer to other occupations.

Earnings

In 1984, trainees earned about $260 a week, according to the limited information available. Experienced repairers earned between $300 and $460 a week, while highly skilled specialists earned up to $520. The wide variation in wage rates reflects differences in skill level, type of employer, and geographic location.

A few service technicians are members of labor unions. Most of these belong to the International Brotherhood of Electrical Workers.

Related Occupations

Other occupations in which workers repair electronic equipment include home appliance and power tool repairers, office machine and cash register servicers, computer service technicians, and commercial and industrial electronic equipment repairers.

Sources of Additional Information

For more information about jobs in this field, contact local shops and stores that service radio and television sets and other electronic equipment. Technical and vocational schools that offer courses in radio and television repair or electronics may provide information about training. In addition, locals of the International Brotherhood of Electrical Workers and the local office of the State employment service may have information about programs that provide training opportunities.

Information about the work of electronic home entertainment equipment repairers is available from:

National Association of Television and Electronic Servicers of America (NATESA), 4621 N. Kedzie Ave., Chicago, Ill. 60629.

Electronics Industries Association, 2001 Eye St. NW., Washington, D.C. 20006.

National Electronic Sales and Service Dealers Association and the International Society of Certified Electronics Technicians, 2708 West Berry St., Fort Worth, Tex. 76109.

Home Appliance and Power Tool Repairers

(D.O.T. 637.261-010 and -018; 723.381 and .584; 729.281-022; and 827.261, .464, and .661)

Nature of the Work

Household chores such as cooking and cleaning or trimming the hedges that once took a great deal of time and physical effort are today much simpler to do—thanks to a variety of laborsaving appliances. Microwave ovens cook meals in minutes. Washers and dryers clean clothes with little physical effort. Hedge trimmers help keep shrubs neat in a fraction of the time required by hand. Indeed, the number of household jobs machines can do is almost limitless. Installing and servicing these machines is the job of the home appliance and power tool repairers—often called service technicians.

Technicians usually specialize. They may service small appliances such as toasters and vacuum cleaners; major appliances such as refrigerators, freezers, washers, and dryers; or power tools such as lawnmowers, electric drills, and power saws. Repairers in large shops generally are more specialized than those in small shops.

Portable appliances are worked on in shops. Major appliances usually are repaired in customers' homes by appliance repairers who carry their tools and a number of commonly used parts with them in a truck.

To determine why an appliance or power tool fails to operate or work properly, repairers look for frequent sources of trouble, such as faulty electrical connections, and consult service manuals and troubleshooting guides. They may disassemble the appliance or tool to examine its parts. To check electrical systems, repairers follow wiring diagrams and use testing devices, such as ammeters, voltmeters, and wattmeters.

After identifying the problem, the technician makes the necessary repairs or replacements. To fix a portable appliance such as a toaster oven, the repairer may replace a defective heating element. To fix a major appliance such as a washer, the repairer may replace worn bearings, transmission belts, or gears. To remove old parts and install new ones, repairers use common handtools, including screwdrivers, soldering irons, files, pliers, and special tools designed for particular appliances. When servicing appliances with electronic parts, the repairer may only have to replace a circuit board or other electronic component. After completing a repair, technicians operate the appliance to check their work.

Repairers answer customers' questions and complaints about appliances and frequently advise customers about their care and use. For example, they may demonstrate how to load automatic washing machines, arrange dishes in dishwashers, or how to sharpen a chain saw blade.

Technicians may estimate and collect the cost of repairs. They also keep records of parts used and hours worked on each job.

Working Conditions

Repair shops generally are quiet, well lighted, and adequately ventilated. Working conditions outside the shop vary. For example, repairers sometimes work in cramped and uncomfortable positions amidst dirt and dust. Those who repair appliances in homes may spend several hours a day driving.

The work generally is safe, but technicians must exercise care and follow safety precautions when handling electrical parts and lifting and moving large appliances.

Home appliance and power tool repairers generally work a 40-hour week, but, in order to meet the needs of the growing number of families where no one is home during working hours, many repair shops are expanding their service hours to include early mornings, evenings, and Saturdays.

Home appliance and power tool repairers usually work with little or no direct supervision, a feature of the job that appeals to many people.

Employment

Home appliance and power tool repairers held about 83,000 jobs in 1984. About 7 out of 10 worked in retail trade establishments such as department stores, household appliance stores, and dealers that sell or service appliances and power tools. Others worked for gas and electric utility companies, wholesalers, and electrical repair shops. About 1 out of 7 repairers was self-employed.

Appliance and power tool technicians are employed in almost every community, but are concentrated in the more highly populated areas.

Training, Other Qualifications, and Advancement

Home appliance and power tool repairers generally learn their trade on the job. Many entrants acquire their skills in other occupations and transfer into appliance repair. Some technicians complete formal training in appliance repair and related subjects in high schools, private vocational schools, and community colleges. No matter how their basic skills are developed, repairers usually get additional training from their employer.

The type of training provided by employers varies among companies. In shops that fix portable appliances, new employees work on a single type of appliance, such as vacuum cleaners, until they master its repair. Trainees then move on to work on a different type of appliance; this process continues until they can repair a variety of appliances. In companies that repair major appliances, beginners may be trained by experienced repairers during repair visits. In other cases, they are taught in the shop to locate basic controls from a schematic drawing, to analyze and determine whether to repair or replace specific parts, and to learn precautions to be taken during removal and replacement of controls. Up to 3 years of on-the-job training may be needed to become skilled in all aspects of repair of the more complex appliances.

Appliance repairers may estimate and collect the cost of repairs.

Some large companies such as appliance and power tool manufacturers and department store chains have formal training programs, which include home study courses and shop classes, where trainees work with demonstration appliances and other training equipment.

Many repairers receive supplemental instruction through seminars that are conducted periodically by appliance and power tool manufacturers. These seminars usually last 1 or 2 weeks and deal with the repair of one of the manufacturer's appliances or tools. To become familiar with new appliances and power tools and the proper ways to repair them, experienced repairers attend training classes or study service manuals.

Persons who want to become home appliance and power tool repairers generally must have a high school diploma. Courses in basic electricity and electronics are desirable because most repairs involve work with electrical equipment, and more and more appliances have electronic components. Mechanical aptitude is also desirable. Technicians who work in customers' homes must be courteous and tactful.

Repairers in large shops or service centers may be promoted to supervisor, assistant service manager, or service manager. A few may advance to managerial positions such as regional service manager or parts manager for appliance or tool manufacturers. Preference is given to those who show ability to get along with coworkers and customers. Experienced repairers who have sufficient funds and knowledge of small business management may open their own appliance stores or repair shops.

Job Outlook

Employment of home appliance and power tool repairers is expected to grow about as fast as the average for all occupations through the mid-1990's. The number of home appliances and power tools in use is expected to increase as the number of households grows and new and improved appliances and tools are introduced. But increasing use of electronic parts such as solid-state circuitry, microprocessors, and sensing devices in appliances should make them more reliable and lessen somewhat the need for repairers. Although a smaller than average proportion of appliance repairers leave the occupation, virtually all openings for appliance repairers will arise from the need to replace workers who transfer to other occupations or leave the labor force.

Technicians with a strong background in electronics should have the best job prospects. Employment is relatively steady because the demand for appliance repair services continues even during economic downturns.

Earnings

Median weekly earnings of home appliance and power tool repairers who were not self-employed were $350 in 1984; the middle 50 percent earned between $230 and $470 weekly. The lowest 10 percent earned less than $180, while the highest 10 percent earned over $560. Variations in wages reflect differences in skill and experience, geographic location, and the type of equipment serviced.

Some home appliance and power tool repairers belong to the International Brotherhood of Electrical Workers.

Related Occupations

Other workers who service electrical and electronic equipment include heating, air-conditioning, and refrigeration mechanics, pinsetter mechanics, office machine and cash register servicers, electronic home entertainment equipment repairers, and vending machine servicers and repairers.

Sources of Additional Information

For further information about jobs in the home appliance and power tool repair field, contact local appliance repair shops, appliance dealers, and utility companies, or the local office of the State employment service.

Information about training programs or work opportunities also is available from:

Association of Home Appliance Manufacturers, 20 N. Wacker Dr., Chicago, Ill. 60606.

Appliance Service News, P.O. Box 789, Lombard, Ill. 60148.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Line Installers and Cable Splicers

(D.O.T. 821.261-010, -014, -022, and -026, .281, .361-010, -018, -022, -026, -030, and -038, .687; 822.381-014; 823.261-014; 829.361-010 and -014; and 959.362-010)

Nature of the Work

A vast network of wires and cables links the electric power produced in generating plants to individual customers, connects telephone central offices to customers' telephones and switchboards, and extends cable TV to residential and commercial customers. This network is constructed and maintained by line installers and cable splicers and their helpers.

To install new electric power or telephone lines, line installers, often referred to as outside plant technicians or construction line workers, install poles and terminals and place wires and cables that lead from the central office or generating plant to customers' premises. They usually use power-driven equipment to dig holes and set in the poles that support cables. Line installers climb the poles or use truck-mounted buckets (aerial work platforms) and then use various handtools to attach the cables. When working with electric power lines, installers must bolt or clamp insulators onto the pole before the cable can be attached. They may add other equipment to the erected poles and towers, such as lightning arrestors, transformers, circuit breakers, or switches. Telephone line installers usually leave the ends free for cable splicers to connect later. Electric utility line workers are usually required to splice the cables at the time of installation.

In cities where power and telephone lines are below the streets, installers place cables in underground conduits. In newly developed residential and rural areas, installers use trenchers, plows, and other special power-driven equipment to bury cable directly underground. Line installers also place cable television lines underground. These lines transmit the broadcast signal from a microwave tower to the customer's home. Cable television installers and repairers connect the customer's television set to the cable television line by installing a coaxial drop wire with connectors.

After line installers place cables on poles, towers, or in underground conduits and trenches, cable splicers, also referred to as cable splicing technicians, generally complete the line connections. In some cases, electric powerline workers install and splice the cables simultaneously. Splicers work on poles, aerial ladders and platforms, in manholes, or in basements of large buildings. When splicing fiber optic cables, which contain tiny, hair-thin glass fibers that transmit voice, data, or video information by light, the delicate connections are made in vans positioned close to the splice point. Splicers connect individual wires or fibers within the cable and rearrange wires when lines have to be changed. They must first read and interpret service orders and circuit diagrams in order to determine the proper splicing specification. Splices are then made by twisting, soldering, or joining wires and cables with small handtools, epoxy, and even with mechanical equipment. For example, cable splicers use machines that use heat to connect fiber optics strands. At each splice, they place insulation over the conductor, and seal the splice with a lead sleeve or cover the splice with some other type of protective covering. For example, they may fill the cable sheathing on critical transmission routes with compressed air so that leaks in the sheathing can be monitored and repaired.

Line installers and cable splicers spend much of their time maintaining and repairing installed telephone, power, and cable television lines. In some areas, this is done by a separate group of workers called cable repair technicians or cable testing technicians. Installers do preventive maintenance by periodically checking to make sure lines are clear of tree limbs or other obstructions that could cause problems. Cable splicers routinely check to make sure that insulation on cables is in good condition and that insulators and other equipment on line poles are working properly. This preventive maintenance is extremely important, because a single defect in a cable may interrupt service for many customers. When wires or cables break, or when poles are knocked down or underground ducts collapse, these workers must make emergency repairs as rapidly as possible. These repairs are most common in parts of the country that have hurricanes, tornadoes, earthquakes, and heavy snowfalls.

Working Conditions

Line installers and cable splicers usually work outdoors in all kinds of weather. They must do a lot of climbing and lifting, and often work in stooped and cramped positions. Electric powerline workers have the most hazardous jobs. They typically work at higher elevations since the electric cable is always above telephone and cable TV lines. Moreover, all of the voltages electric powerline workers come in contact with can cause death if safe work practices are not adhered to. Line installers and cable splicers also must wear safety equipment when entering manholes. In addition, they are required to test for the presence of gas before going underground. These workers are subject to 24-hour call. For example, when severe weather damages transmission and distribution lines, they may be called upon to work long and irregular hours to restore service. At times they may travel to distant locations—and occasionally stay for a lengthy period to help restore damaged facilities or build new ones.

Employment

Line installers and cable splicers held about 204,000 jobs in 1984. Nearly all worked full time for publicly and privately owned power companies, construction companies specializing in power line and cable TV construction, and telephone companies.

Training, Other Qualifications, and Advancement

Line installer usually is an entry level job in telephone companies. Line installers in utilities begin as helpers or grounds workers. Although local hiring policies vary, most employers prefer high school graduates. High school courses help develop the reading and arithmetic skills essential for understanding company manuals and work orders. Many employers test applicants for basic verbal, arithmetic, and abstract reasoning skills. In addition, there are entry tests of physical ability such as balance, coordination, and strength. Applicants also may be tested for mechanical aptitude. Knowledge of the basic principles of electricity and training in installing telephone systems obtained in the Armed Forces or vocational education programs may be helpful. Because the work entails a lot of climbing, applicants should have stamina and must be unafraid of heights. The ability to distinguish colors is necessary because wires and cables usually are coded by color. Motivation, self-discipline, and the ability to work as part of a team are needed to work efficiently and safely.

Training programs for line installers and cable splicers include classroom instruction as well as on-the-job training. In addition, some employers are beginning to use other teaching aids to supplement classroom instruction. These may include computer- assisted instruction, video cassettes, movies, or "programmed" workbooks. Some classrooms are equipped with actual equipment, such as poles, cable-supporting clamps, and other fixtures, to simulate working conditions as closely as possible. Trainees learn to work on poles while keeping their hands free to work. For example, in one classroom exercise, they play catch with a basketball while on the poles. Trainees also are taught safe working practices to avoid falls and contact with power wires. Classroom training, which also includes instruction in electrical codes, blueprint reading, and beginning electrical theory, is followed by on-the-job training. Trainees are assigned to a crew to work with experienced line installers under a line supervisor.

In addition to the training by employers, line and cable workers may attend a training school provided by manufacturers who sell cable installation equipment to telephone, electric power, or cable TV companies. At other times, manufacturers send instructors to the job site.

Line installers and cable splicers work at dangerous heights, close to potentially dangerous powerlines.

Some small companies, particularly those in rural areas, do not have adequate facilities to train their employees. Therefore, they may rely on local vocational and technical schools to provide classroom training to craft employees.

Line installers and cable splicers continue to receive training throughout their careers to qualify for more difficult assignments and to keep up with technological changes. For example, crews of cable splicers are introduced to the techniques of fiber optic cable splicing by having several days of training and several additional days of field supervision. Because there have been fewer changes in electric powerline installation and repair, less training is needed to update utility line workers. Line workers receive whatever continuing education they need from their employer, as well as from short courses in colleges, universities, community colleges, technical schools, and private firms.

For installers, advancement may come about through promotion to splicer, or to a higher level occupation such as communications equipment mechanic or transformer inspector. Promotion to a supervisory position is also possible.

Cable splicers may transfer to other highly skilled jobs—in the telephone industry, for example, cable splicers can advance to central office equipment installer or PBX installer—or may move into other kinds of work, such as sales. Promotion also is possible to crew supervisor or instructor of new employees.

Job Outlook

Employment of line installers and cable splicers is expected to grow about as fast as the average for all occupations through the mid-1990's. A growing and increasingly mobile population will require additional telephone, electric power, and cable television lines. Building these new cable systems and modernizing and maintaining existing systems will provide jobs for line installers and cable splicers. Nevertheless, most job openings will arise from the need to replace workers who transfer to other occupations, retire, or stop working for other reasons.

Despite the strong demand for telephone services and electricity, technological advances that improve productivity should keep employment from rising as fast as demand. For example, fewer line workers will be needed in the future as microwave towers and fiber optics cables supplant aerial wires for long-distance telephone communications. New communication systems are not as vulnerable to adverse weather conditions as aerial wires, and fewer workers are needed to maintain them. New kinds of splices and the telephone splicing van that uses a self-contained engine to heat and ventilate manholes, as well as new power tools and equipment also will continue to improve the efficiency of cable splicers.

Technological improvements and changing business practices have reduced labor requirements in some occupations, resulting in some layoffs. Some unneeded workers are given a choice of transferring to other geographic areas where they are needed, or of being placed in a different job in the same area. Telephone and electric power companies lay off workers only as a last resort. The policy of preference for company employees may, however, limit the number of job openings available to others.

Earnings

Pay rates for line installers and cable splicers vary greatly across the country; specific information may be obtained from local telephone, electric power, and cable TV companies. Earnings also depend on length of service. It generally takes about 5 years to go from the bottom to the top of the pay scale. In 1984, line installers and cable splicers earned a median hourly wage of $12.20. The middle 50 percent earned between $10.40 and $14.50. The bottom 10 percent earned less than $7.80; the top 10 percent earned more than $17 an hour. Because of low job turnover in these occupations, many workers earn salaries near the top of the pay scale, which is about twice the average for all nonsupervisory workers in private industry, except farming.

Most line installers and cable splicers belong to unions, principally the Communications Workers of America, the International Brotherhood of Electrical Workers, and the Telecommunications International Union. For these workers, union contracts set wage rates, wage increases, and the time needed to advance from one step to the next. These contracts require extra pay for overtime and for all work on Sundays and holidays. Most contracts provide for additional pay for night work. Time in service determines the length of paid vacations. Depending on the locality, there are 9 to 12 holidays a year. Other provisions in contracts include many or all of the following: Paid sick leave; group life, medical, and dental insurance; sickness and accident benefits; vision care; retirement and disability pensions; a savings plan; educational benefits; and an employee stock ownership plan.

Related Occupations

Workers in other skilled crafts and trades who do manual work with tools and machines include communications equipment mechanics, biomedical equipment technicians, telephone installers and repairers, electricians, and sound technicians.

Sources of Additional Information

For more details about employment opportunities, contact the telephone or electric power company in your community or local offices of the unions that represent these workers. For general information on line installer and cable splicer jobs, write to:

Communications Workers of America, 1925 K St. NW., Washington, D.C. 20006.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Suite 1201, Washington, D.C. 20005.

Telecommunications International Union, 2341 Whitney Ave., Hamden, Conn. 06518.

Telephone Installers and Repairers

(D.O.T. 822.261-022 and .281-018)

Nature of the Work

Telephone installers and repairers install, service, and repair telephones, switchboard systems, and other communications equipment on customers' property. Frequently referred to as service technicians, they generally travel to customers' homes and offices in vehicles equipped with telephone tools and supplies. Before making any installations or repairs, they read and interpret service orders, technical manuals, and circuit wiring diagrams. They also keep detailed and accurate records of all work activity. When customers move or request new types of service, installers relocate telephones or make changes on existing equipment. For example, they may install a pay telephone in a store, or change a two-party line to a single-party line in a residence. Installers also may add an extension in another room or replace an old telephone with a new model. After installation, they test the equipment to make sure that it is working properly. In some areas, these workers may handle special cases such as public service commission complaints, illegal or unauthorized use of equipment, and electric or acoustic shocks. Many installers and repairers promote improved customer service by demonstrating various kinds of telephone equipment or services.

Telephone installers, sometimes called station installers, install, rearrange, and remove telephones in homes and business places. They assemble equipment and install wiring at the customers' premises using a variety of handtools. They connect telephones to outside service wires and sometimes must climb poles or ladders to make these connections. Occasionally, especially in apartment buildings, the service wires or terminals are in the basement of the building. In many large building complexes, these wires or terminals are located in wire closets.

Telephone repairers test, clean, fix, or replace faulty equipment or wiring. Working closely with trouble locators in the central office, they locate and analyze trouble on customers' equipment and in outdoor public facilities.

A repairer finds the source of the problem by connecting a test set to the customer's telephone line and then testing in conjunction with the trouble locator in the central office.

Working Conditions

Telephone installers and repairers work in many kinds of places, both indoors and outdoors, and in all kinds of weather. Their work involves lifting, climbing, reaching, stooping, crouching, and crawling. They must not be afraid to work in high places such as on rooftops, ladders, and telephone poles. Because telephone service must be maintained at all times, these workers are subject to 24-hour call, as are all telephone company employees. Often this means working under adverse weather conditions. Workers also may be required to work evening and night shifts. Because breakdowns in lines or equipment can occur at any time, work on holidays and on nonscheduled days may be required.

Employment

Telephone installers and repairers held about 111,000 jobs in 1984. More than 9 out of 10 worked full time for telephone companies.

Training, Other Qualifications, and Advancement

Trainees usually are chosen from the ranks of telephone company employees such as operators, clerical workers, and line installers. A basic knowledge of electricity and electronics gained from previous work experience or schooling, as well as telephone training in the Armed Forces, are assets in being accepted for training. In addition, applicants must have good eyesight and the ability to distinguish colors. Physical examinations may be required because the work may involve strenuous activities such as climbing poles and lifting and carrying heavy objects. Good balance is necessary in order to work in high places and for crouching or stooping in cramped areas. Practical problem-solving ability is essential, as in all repair jobs. Because these workers deal with the public, a pleasant and patient disposition is an advantage.

Applicants for telephone installer or repairer jobs must have the ability to learn a craft, and may have to take a mechanical aptitude test as well as tests that measure mathematical skills. Workers in these jobs must be adept at handling small tools, such as pliers and screwdrivers, and be able to read blueprints, interpret work orders and circuit diagrams, and understand company manuals and directions for telephone installation and repair. Most employers require a high school diploma or the equivalent for telephone craft jobs.

Telephone installer-repairer trainees receive classroom instruction in subjects such as electrical and electronic theory. Practical instruction is provided in training facilities equipped with telephone poles, lines and cables, terminal boxes, and other equipment. There, in a simulated work environment, trainees practice installing telephones and connecting wires just as they would on the job. After several weeks of classroom training, new employees are assigned to assist experienced workers before going out alone to install telephones.

Because many small telephone companies, especially in rural areas, do not have training facilities, they use community colleges and vocational technical schools in these areas to train telephone installers and repairers. If travel is required during training—to a regional training school, for example—the company pays the cost.

In recent years, some telephone companies have begun to use modular training programs for their workers. Modular training is used to supplement other, more traditional forms of training. Training modules may include some or all of the following: Entry tests; video modules such as computer terminals, movies, and video cassettes; programmed workbooks; exit tests; and skill mastery tests where the trainee demonstrates the skills he or she has learned. Workers using training modules can learn various aspects of their craft at their own convenience and pace.

Telephone craft workers receive training throughout their careers to qualify for more responsible assignments and to keep up with technological changes. Courses are offered by colleges, universities, private firms, and State telephone associations, as well as by the telephone companies themselves. With further training, telephone installer-repairers can advance to supervisor, to sales and customer service jobs or, with additional study of electronics, to more advanced technical jobs such as PBX installer or switching equipment technician.

Telephone installers test the connections to ensure that telephones are working.

Job Outlook

Employment of telephone installers and repairers is expected to decline through the mid-1990's. Employment of telephone installers and repairers will fall as technological improvements make this work less labor intensive. For example, changes such as pre-wired buildings that enable customers to select telephones, take them home, and plug them in have effectively eliminated the functions of the installer. The modular assembly of telephones, where components plug in and out, also has reduced the time and skills needed for repair.

After the breakup of the American Telephone and Telegraph Company (AT&T), a large number of households and firms bought their phones and became responsible for repair work. The high cost of repair has reduced demand for telephone repairers because it often costs as much to fix a phone as it does to buy a new one. With employment projected to decline, job openings will result exclusively from the need to replace persons who transfer to other occupations, retire, or leave the labor force for other reasons. Openings for telephone installers and repairers usually are filled by workers in other telephone jobs, such as operators, service representatives, line installers, clerks, or drivers. As technology continues to displace telephone workers, competition for these openings should intensify, making it more difficult for "outsiders" to compete for jobs.

Earnings

Pay scales vary greatly across the country; specific information may be obtained from local telephone companies. Earnings also depend on length of service. Generally, it takes about 5 years to progress from the beginning rate to the top of the pay scale. In 1984, median hourly pay for telephone installers and repairers was $13.02. The middle 50 percent earned between $10.80 and $14.50 an hour. The bottom 10 percent earned less than $8; the top 10 percent earned more than $16.80.

Most telephone installers and repairers belong to unions, principally the Communications Workers of America, the International Brotherhood of Electrical Workers, and the Telecommunications International Union. Union contracts govern wage rates, wage increases, and the time needed to progress from one grade to the next. Contracts stipulate extra pay for work performed beyond the normal 8 hours a day or 5 days a week, as well as for that performed on holidays and Sundays. Most contracts provide a pay differential for nightwork. Paid vacations are granted according to length of service. Normally, contracts provide for a 1-week vacation beginning with 6 months of service; 2 weeks for 1 to 6 years; 3 weeks for 7 to 14 years; 4 weeks for 15 to 24 years; and 5 weeks for 25 years and over. Depending on the locality, holidays range from 9 to 12 days a year. Other benefits include the following: Paid sick leave; group life, medical, and dental insurance; vision care; sickness and accident benefits; retirement and disability pensions; a savings plan; and an employee stock ownership plan.

Related Occupations

Other skilled workers whose jobs require manual dexterity and technical knowledge of tools and machines include communications equipment mechanics, biomedical equipment technicians, electricians, sound technicians, line installers, and cable splicers.

Sources of Additional Information

For more details about employment opportunities, contact the telephone company in your community or local offices of the unions that represent telephone workers. For general information on telephone installer and repairer jobs, write to:

Communications Workers of America, 1925 K St. NW., Washington, D.C. 20006.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Telecommunications International Union, 2341 Whitney Ave., Hamden, Conn. 06518.

For additional information on the telephone industry and career opportunities in it, request copies of *Phonefacts* and *Is It for You? A Career in the Independent Telephone Industry* from:

United States Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

Other Mechanics and Repairers

General Maintenance Mechanics

(D.O.T. 899.281-014; 899.381-010)

Nature of the Work

Most craft workers specialize in one kind of work; general maintenance mechanics are jacks-of-all-trades. They repair and maintain machines, mechanical equipment, and buildings, and work on plumbing, electrical, and air-conditioning and heating systems. They build partitions, make plaster or drywall repairs, and fix or paint roofs, windows, doors, floors, woodwork, and other parts of building structures. They also install, maintain, and repair specialized equipment and machinery found in cafeterias, laundries, hospitals, stores, offices, and factories. Typical duties include replacing faulty electrical switches, repairing air-conditioning motors, and installing water lines.

Those in small establishments, where they are often the only maintenance worker, do all repairs except for very large or difficult jobs. In larger establishments, they may do work in only a few skills.

General maintenance mechanics inspect and diagnose problems and plan how work will be done, often checking blueprints, repair manuals, and parts catalogs. They obtain supplies and repair parts from distributors or storerooms. They use common hand and power tools such as screwdrivers, saws, drills, wrenches, and hammers as well as specialized equipment and electronic test devices. They replace or fix worn or broken parts, where necessary, or make adjustments.

They also do routine maintenance to correct defects before equipment breaks down or buildings deteriorate. They may follow a check list, inspecting belts, checking fluid levels, replacing filters, and so forth. Maintenance mechanics also keep records of maintenance and repair work.

Employment

General maintenance mechanics held about 880,000 jobs in 1984. They worked in almost every industry. Almost a third were employed in manufacturing industries. Over one-fourth were in service industries; most worked for elementary and secondary schools, colleges and universities, hospitals and nursing homes, and hotels. Others worked for real estate firms that operated office and apartment buildings and for wholesale and retail firms, government agencies, and gas and electric companies.

Working Conditions

General maintenance mechanics often do a variety of tasks in a single day, generally at a number of different locations in a building, or in several buildings. They may have to stand for long periods, lift heavy objects, and work in uncomfortably hot or cold environments. Like other maintenance craft workers, they may work in awkward and cramped positions or on ladders. They are subject to electrical shock, burns, falls, and cuts and bruises. Most general maintenance workers work a 40-hour week. Some work evening or night shifts or on weekends, or may be on call for emergency repairs.

Those employed in small establishments, where they may be the only maintenance worker, often operate with only limited supervision.

Training, Other Qualifications, and Advancement

Most general maintenance mechanics learn their skills informally on the job. They start as helpers, watching and learning from skilled maintenance workers. Helpers begin by doing simple jobs such as fixing leaky faucets and replacing light bulbs and progress to more difficult tasks such as overhauling machinery or building walls.

Others learn their skills by working as helpers to other repair or construction workers such as carpenters, electricians, machinery repairers, or automobile mechanics. Necessary skills can also be learned in high school shop classes and postsecondary trade or vocational schools. It generally takes from 1 to 4 years of on-the-job training and/or school to become fully qualified, depending on the skill level required.

Graduation from high school is preferred, but not always required, for entry into this occupation. High

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General maintenance mechanics perform many different tasks in a day.

school courses in mechanical drawing, electricity, woodworking, blueprint reading, science, and mathematics are useful. Mechanical aptitude, ability to use shop math, and manual dexterity are important. Good physical health is necessary since the job involves much walking, standing, reaching, and heavy lifting. Difficult jobs require problem-solving ability, and many positions require the ability to work without direct supervision.

Some general maintenance mechanics in large organizations advance to maintenance supervisor. In small organizations, promotion opportunities are limited.

Job Outlook

Employment of general maintenance mechanics is expected to grow about as fast as the average for all occupations through the mid-1990's. Employment is related to the number of buildings and amount of equipment needing maintenance and repair. Growth will occur as the number of office and apartment buildings, stores, schools, hospitals, churches, hotels, and factories increases. In addition to jobs created by increased demand for maintenance mechanics, many openings will arise as experienced workers transfer to other occupations or leave the labor force.

Most general maintenance mechanics work in relatively stable nonmanufacturing industries and are not usually subject to layoff during recessions. Those in manufacturing industries, however, may be laid off.

Earnings

Earnings for general maintenance mechanics vary widely depending on years of experience, skill level, industry, and geographic area. According to the limited data available, these workers had average hourly wages ranging from $6 to $12 in 1984. Mechanics may have the opportunity to earn premium pay for working nights or weekends or for overtime pay when handling emergency repairs.

Some general maintenance mechanics are members of unions, including the American Federation of State, County and Municipal Employees and the United Automobile Workers.

Related Occupations

Some of the work of general maintenance mechanics is similar to that of carpenters, plumbers, industrial machinery mechanics, electricians, and air-conditioning, refrigeration, and heating mechanics.

Sources of Additional Information

Information about job opportunities may be obtained from local employers and local offices of the Job Service.

Heating, Air-Conditioning, and Refrigeration Mechanics

(D.O.T. 637.261-014, -026, and -030, and .381; 827.361-014; 862.281-018, .361-010; and 869.281-010)

Nature of the Work

People always have sought ways to make their environment more comfortable. Today, heating and air-conditioning systems control the temperature, humidity, and even the cleanliness of the air in homes, offices, factories, and schools. In addition, refrigeration systems make it possible to safely store food, drugs, and other perishable items. Heating, air-conditioning, and refrigeration mechanics are skilled workers who install, maintain, and repair such systems.

Heating, air-conditioning, or refrigeration requires more than a single appliance. In central heating systems, for example, a furnace heats the air that is then distributed throughout the building through a system of metal or fiberglass ducts. Mechanics must be able to work with the complete system—the ducts as well as all the machinery.

Mechanics may specialize in installation or in service—maintenance and repair. Some work only with certain equipment, such as gas furnaces or commercial refrigerators. However, mechanics may do both installation and service and work with heating, cooling, and refrigeration equipment. The following are some specific jobs in this field.

Furnace installers, also called heating equipment installers, follow blueprints or other specifications to install oil, gas, electric, solid-fuel, and multifuel heating systems. After setting the equipment in place, they install fuel and water supply lines, air ducts and vents, pumps, and other components. They then connect electrical wiring and controls, and check the unit for proper operation. Some workers install solar-energy systems that collect and circulate solar-heated water or air.

Oil burner mechanics keep oil-fired heating systems in good operating condition. During the fall and winter, when the system is needed most, they service and adjust oil burners. If a system is not operating properly, mechanics check the thermostat, burner nozzles, controls, and other parts to locate the problem. The mechanic corrects the problem by adjusting or replacing parts. During the summer, mechanics do maintenance work, such as replacing oil and air filters and vacuum-cleaning vents, ducts, and other parts of the heating system that accumulate soot and ash.

Air-conditioning and refrigeration mechanics install and service central air-conditioning systems and a variety of refrigeration equipment. Mechanics follow blueprints, design specifications, and manufacturers' installation instructions to install motors, compressors, condensing units, evaporators, and other components. They connect this equipment to the duct work, refrigerant lines, and electrical power source. After making the connections, they charge the system with refrigerant and check it for proper operation.

When air-conditioning and refrigeration equipment breaks down, mechanics diagnose the cause and make repairs. To find defects, they test parts such as compressors, relays, and thermostats. During the winter, air-conditioning mechanics inspect the systems and do required maintenance, such as overhauling compressors. Some air-conditioning and refrigeration mechanics also service heating systems.

Heating, air-conditioning, and refrigeration mechanics use a variety of tools, including hammers, wrenches, metal snips, electric drills, pipe cutters and benders, and acetylene torches, to work with refrigerant lines and air ducts. They use voltmeters, thermometers, pressure gauges, manometers, and other testing devices to check air flow, electrical circuits, burners, and other components.

Cooling and heating systems sometimes are installed or repaired by other craft workers. For example, on a large air-conditioning installation job, especially where workers are covered by union contracts, duct work might be done by sheet-metal workers; electrical work by electricians; and installation of piping, condensers, and other components by plumbers and pipefitters. Room air-conditioners and household refrigerators are serviced by home appliance repairers. Additional information about these occupations appears elsewhere in the *Handbook*.

Working Conditions

Mechanics work in homes, office buildings, factories—anywhere there is climate control equipment. They carry their tools and some spare parts to the job sites in trucks and are dispatched to jobs by radio or telephone. For major repairs, mechanics transport broken machinery or parts to the repair shop.

Mechanics may work outside in cold or hot weather or in buildings that are uncomfortable because the air-conditioning or heating equipment is broken. Mechanics often work in awkward or cramped positions and sometimes are required to work in high places. Hazards in this trade include electrical shock, burns, muscle strains, and other injuries from handling heavy equipment.

Employment

Heating, air-conditioning, and refrigeration mechanics held about 173,000 jobs in 1984. Cooling and heating contractors employ most air-conditioning and refrigeration mechanics and furnace installers. Fuel oil dealers employ most oil burner mechanics. Mechanics also work for foodstore chains, school systems and hospitals, manufacturers, and other organizations that operate large air-conditioning, refrigeration, or heating systems. Approximately 1 out of 5 mechanics is self-employed.

Jobs for heating, air-conditioning, and refrigeration mechanics are found throughout the country. The proportion of mechanics in the South is greater than the proportion of the general population. In addition to a longer cooling season, the South has had large increases in population and hence high levels of construction activity in recent years. Both factors increase opportunities for mechanics.

Training, Other Qualifications, and Advancement

Many heating, air-conditioning, and refrigeration mechanics start as helpers and acquire their skills by working for several years with experienced mechanics. New workers usually begin by assisting experienced mechanics and doing simple jobs. They may carry materials, insulate refrigerant lines, or clean furnaces. In time, they do more difficult jobs, such as cutting and soldering pipes and sheet metal and checking electrical and electronic circuits. In 4 to 5 years, new mechanics should be able to do all types of repairs and installations.

Many high schools, private vocational schools, and junior colleges offer programs in heating, air-conditioning, and refrigeration. Students study heating, air-conditioning, and refrigeration theory and the design and construction of the equipment. They also learn the basics of installation, maintenance, and repair. Although completion of such a program does not assure a job, employers may prefer to hire graduates of these programs because they require less on-the-job training. These programs also help students determine if they have an interest and aptitude for the trade.

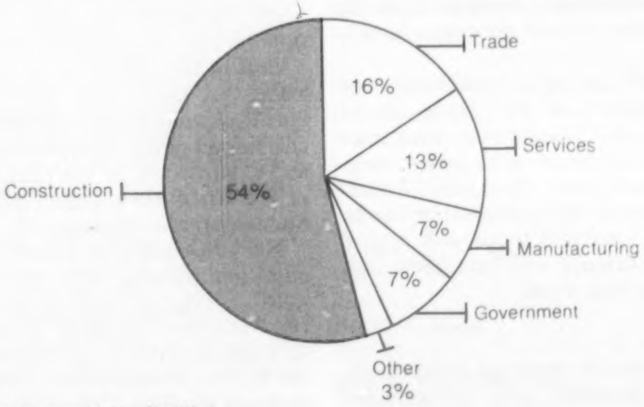
Apprenticeship programs are run by joint apprenticeship committees made up of locals of the United Association of the Plumbing and Pipefitting Industry and some local chapters of the Air-Conditioning Contractors of America and by local chapters of the Associated Builders and Contractors. In addition to on-the-job training, apprentices receive 144 hours of classroom instruction each year in related subjects, such as the use and care of tools, safety practices, blueprint reading, and air-conditioning theory. Applicants for apprenticeships must meet requirements of local apprenticeship committees; for example, they may have to have a high school diploma or pass a mechanical aptitude test. Apprenticeships last 4 years.

When hiring, employers prefer high school graduates with mechanical aptitude who have had courses in shop math, mechanical drawing, electronics, and blueprint reading. A basic understanding of microelectronics is becoming more important because of

An air-conditioning mechanic tests the system to determine if it is functioning properly.

More than half of all heating, air-conditioning, and refrigeration mechanics hold jobs in the construction industry.

Distribution of wage and salary employment, 1984



SOURCE: Bureau of Labor Statistics

the increasing use of this technology in equipment controls. Good physical condition also is necessary because workers sometimes have to lift and move heavy equipment.

To keep up with changes in technology and to expand their skills, experienced mechanics may take courses offered by heating and air-conditioning equipment manufacturers and by associations such as the Refrigeration Service Engineers Society and the Air Conditioning Contractors of America.

Mechanics can advance to positions as supervisors. Those with sufficient money and managerial skill can open their own contracting businesses.

Job Outlook

Employment of heating, air-conditioning, and refrigeration mechanics is expected to increase about as fast as the average for all occupations through the mid-1990's. Employment will increase as more homes and commercial and industrial buildings are constructed. Installations of new energy-saving heating and air-conditioning systems in existing homes and buildings also will increase employment of mechanics. Most job openings, however, will result from the need to replace workers who transfer to other occupations, retire, or leave the occupation for other reasons.

Employment of heating, air-conditioning, and refrigeration mechanics usually is not as sensitive to downturns in the economy as some other construction occupations because maintenance of existing systems and installation of new, more efficient equipment in existing buildings make up a large part of their work. Because people and businesses depend on their heating, air-conditioning, and refrigeration systems, the need for mechanics to do maintenance work is relatively strong even during economic downturns.

Because the high earnings and good job prospects of this trade attract many people, beginning mechanics may face competition for jobs as helpers or apprentices. Graduates of training programs that emphasize hands-on experience and those with related work experience will have an advantage in getting a job.

Earnings

Median weekly earnings of air-conditioning, heating, and, refrigeration mechanics who were not self-employed were $370 in 1984. The middle 50 percent earned between $270 and $480. The lowest 10 percent earned less than $210 a week, and the same proportion earned more than $615 a week.

Apprentices receive a percentage of the wage paid experienced workers, about 40 percent at the beginning of their training and about 85 percent during the fourth year. Mechanics who work on both heating equipment and air-conditioning frequently have higher rates of pay than those who work on only one type of equipment.

Mechanics usually work a 40-hour week. However, during peak seasons, they often work overtime or irregular hours. Most employers try to provide a full workweek the year round, but they may temporarily reduce hours or lay off some mechanics when the season is over. Employment in most shops that service both heating and air-conditioning equipment is fairly stable throughout the year.

Some mechanics are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry or the Sheet Metal Workers International Association.

Related Occupations

Heating, air-conditioning, and refrigeration mechanics work with sheet metal and piping, and repair machinery, such as electrical motors, compressors, and burners. Other workers who have similar skills are boilermakers, electrical appliance servicers, electricians, pipefitters, plumbers, and sheet-metal workers.

Sources of Additional Information

For more information about employment and training opportunities in this trade, contact local heating, air-conditioning, and refrigeration contractors; a local of the unions previously mentioned; a local joint union-management apprenticeship committee; a local chapter of the Associated Builders and Contractors; or the nearest office of the State employment service or State apprenticeship agency.

For information on career opportunities and training, write to:

Air-Conditioning and Refrigeration Institute, 1501 Wilson Blvd., Arlington, Va. 22209.

Air Conditioning Contractors of America, 1228 17th St. NW., Washington, D.C. 20036.

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

Refrigeration Service Engineers Society, 1666 Rand Rd., Des Plaines, Ill. 60016.

Industrial Machinery Repairers

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

When a machine breaks down in a plant or factory, not only is the machine idle, but raw materials and human resources are wasted. It is the industrial machinery repairer's job to prevent these costly breakdowns and to make repairs as quickly as possible.

Industrial machinery repairers—often called maintenance mechanics—spend much of their time doing preventive maintenance. This includes keeping machines well oiled and greased, and periodically cleaning parts. Repairers regularly inspect machinery and check performance. They use tools such as micrometers, calipers, and depth gauges to measure and align all parts. For example, forearms on industrial robots in motor vehicle manufacturing plants need frequent adjustment, and gears, bearings, and other mechanical parts have to be aligned and lubricated. By keeping complete and up-to-date records, mechanics try to anticipate trouble and service the machinery before factory production is interrupted.

When repairs become necessary, the maintenance mechanic must first locate the specific cause of the problem. This requires knowledge reinforced by experience. For example, after hearing a vibration from a machine, the mechanic must decide whether it is due to worn belts, weak motor bearings, or any number of other possibilities. New industrial machinery often is equipped with computer control panels that indicate the source of mechanical problems.

After the problem has been diagnosed, the maintenance mechanic disassembles the equipment and repairs or replaces the necessary parts. A wide range of tools may be used. For example, repairers may use a screwdriver and wrench to adjust an engine, or a hoist to lift a printing press off the ground. Repairers use catalogs to order replacements for broken or defective parts. When parts are not readily available, or when a machine must be quickly returned to production, repairers may sketch a part that can be fabricated by the plant's machine shop. Repairers often follow blueprints and engineering specifications in maintaining and fixing equipment. After the equipment has been serviced, the repairer reassembles and tests it.

Some of the industrial machinery repairer's duties may be performed by millwrights. (See the statement on millwrights elsewhere in the *Handbook*.)

Working Conditions

Repairers may work in stooped or cramped positions, to reach the underside of a generator, for example. They also may work from the top of a ladder when repairing a large machine. These workers are subject to common shop injuries such as cuts and bruises. Because factories and other organizations cannot afford breakdowns in industrial machinery, industrial machinery repairers may be called to the plant at night or on weekends for emergency repairs.

Employment

Industrial machinery repairers held about 430,000 jobs in 1984. Repairers work in every industry in which a great deal of machinery is used. Six of every ten work in manufacturing industries, primarily in machine shops, printing plants, oil refineries, garment shops, automobile and aircraft companies, and food processing plants. Others work for government agencies and for service firms that maintain equipment for a fee.

Because industrial machinery repairers work in a wide variety of plants, they are employed in every section of the country. Employment is concentrated, however, in heavily industrialized areas.

Training, Other Qualifications, and Advancement

Most workers who become industrial machinery repairers start as helpers and pick up the skills of the trade informally and by taking courses offered by machine manufacturers. Some learn the trade through apprenticeship programs sponsored by the United Automobile, Aerospace and Agricultural Implement Workers of America and the International Union of Electronic, Electrical, Technical, Salaried and Machine Workers. This training usually lasts 4 years and consists of on-the-job training and related classroom instruction. Apprentices learn how to operate, disassemble, and repair machinery from experienced repairers. Classroom instruction focuses on subjects such as shop mathematics, shop theory, blueprint reading, welding, and safety. Electronics training is offered as a part of the apprenticeship program but is not required. However, a growing number of employers prefer this background.

Graduation from high school is preferred, but not always required, for entry into this occupation. However, participants in apprenticeship programs must have a high school diploma or the equivalent. High school courses in mechanical drawing, mathematics, blueprint reading, physics, and electronics are useful.

Mechanical aptitude and manual dexterity are important qualifications for workers in this trade. Good physical condition and agility are also necessary because repairers sometimes have to lift heavy objects or climb to reach equipment located high above the floor.

Opportunities for advancement are limited. Industrial machinery repairers advance either by working with more complicated equipment or by becoming a supervisor.

Examinations may be administered periodically by employers to determine the repairer's ability to maintain more advanced machinery. Some of the most highly skilled repairers can be promoted to master mechanics or become machinists or tool-and-die makers.

Job Outlook

Employment of industrial machinery repairers is expected to grow more slowly than the average for all occupations through the mid-1990's. Fewer industrial machinery repairers will be needed because of the lower maintenance requirements of new industrial equipment. Although some jobs will be created due to increased demand for industrial machinery repairers, most openings will result each year from the need to replace repairers who transfer to other occupations, retire, or die.

Industrial machinery repairers are not usually affected by seasonal changes in production. During slack periods, when some plant workers are laid off, repairers often are retained to do major overhaul jobs. Although these workers may face layoff or a reduced workweek when economic conditions are particularly severe, they generally are less affected than other workers because machines have to be maintained regardless of the level of production.

Machinery breakdowns are costly and equipment must be repaired as soon as possible.

Earnings

According to the available data, industrial machinery repairers had average hourly wages of $12.33 in 1984, about 50 percent higher than the average for all nonsupervisory workers in private industry, except farming. Average hourly earnings of industrial machinery repairers in 22 areas that represent various regions of the country are shown in table 1.

Table 1. Average hourly earnings of industrial machinery repairers, selected areas, 1984

Area	Hourly rate
Detroit	$13.98
Houston	12.96
Chicago	12.85
Baltimore	12.77
Los Angeles	12.65
New York	12.20
Minneapolis-St. Paul	11.50
Boston	11.03
Miami	10.64
Portland, Maine	10.62
Atlanta	10.56

SOURCE: Bureau of Labor Statistics.

Labor unions to which most industrial machinery repairers belong include the United Steelworkers of America; the United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Union of Electronic, Electrical, Technical, Salaried and Machine Workers.

Related Occupations

Other occupations which involve repairing machinery include aircraft mechanics and engine specialists, automotive and motorcycle mechanics, bowling-pin-machine mechanics, diesel mechanics, farm equipment mechanics, machinists, millwrights, tool-and-die makers, and vending machine mechanics.

Sources of Additional Information

Information about employment and apprenticeship opportunities in this field may be available from local offices of the State employment service or from:

International Union of Electronic, Electrical, Technical, Salaried and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

Millwrights

(D.O.T. 638.261-010, -014, -018, .281-018, and -022)

Nature of the Work

The textile industry in England was one of the first industries to use machinery to mass produce goods. The workers who planned and built the textile mills and set up the equipment that was needed were called millwrights. The occupation gradually expanded to other factories, and today the millwright installs and dismantles machinery and heavy equipment used in almost every industry, from food processing to oil and gas extraction.

The millwright's responsibilities begin when machinery arrives at the job site. The new equipment must be unpacked and unloaded, inspected for damaged and missing parts, and then moved into position. To lift and move light machinery, millwrights may use rigging and hoisting devices such as pulleys and cables. Moving machinery sometimes requires the assistance of a hydraulic lift-truck operator. In cases where machinery and parts are too heavy for handtools and lift-trucks, millwrights must rely on crane operators to position the machinery in its new site.

Because millwrights often decide what device to use for moving machinery, they must know the load-bearing properties of ropes, cables, hoists, and cranes. For example, when installing a new oven in a food processing plant, a millwright sets up steel cables and a small hoist to move the oven from the truck on which it arrived to the conveyor that will carry it into the plant. The oven is then lifted, with other hoisting devices and perhaps the aid of a crowbar for leverage, onto a dolly and taken to the foundation for proper positioning.

New machinery sometimes requires a new foundation. Since they either personally prepare the foundation or supervise its construction, millwrights must know how to read blueprints and work with building materials such as concrete, wood, and steel.

In assembling machinery, millwrights fit bearings, align gears and wheels, attach motors, and connect belts according to the manufacturer's blueprints and drawings. Precision leveling and alignment are important in the assembly process; millwrights must have good mathematical skills so that they can measure angles, material thickness, and small distances with tools such as squares, calipers, and micrometers. In some cases, particularly when lining up conveyor machinery or tracks, a millwright may use laser equipment to "shoot" a straight line over long distances. Millwrights also use hand and power tools, cutting torches, welding machines, and soldering guns. Some millwrights use metalworking lathes to grind or turn parts to specifications.

A growing number of millwrights install industrial robots in manufacturing plants. In these factories, millwrights also rearrange machinery, install conveyors and tracks, or reroute them in order to make better use of available space.

A millwright is often called a "jack of all trades" because of the variety of skills the job entails. In addition to installing and dismantling machinery, many millwrights repair and maintain equipment. This includes preventive maintenance, such as lubrication, and fixing or replacing worn parts. (For further information on machinery maintenance occupations, see the statements on industrial machinery mechanics and general maintenance mechanics elsewhere in the *Handbook.*)

Millwrights employed by contract installation and construction companies must know how to do a variety of installation work. Those employed in factories usually need to be familiar with only the particular types of machinery used by their employers.

Working Conditions

Millwrights employed by factories ordinarily work year round. Those employed by construction companies may experience periods of unemployment; however, they usually are compensated with a higher hourly wage rate. Millwrights who work for companies that manufacture and install machinery may travel a lot.

Millwrights are subject to the usual shop hazards, such as cuts and bruises, associated with working around machinery. Injury from falling objects or machinery that is being moved, and from falls from scaffolding and catwalks, can be avoided or reduced by the use of protective devices such as safety belts and hard hats.

Employment

Millwrights held about 84,000 jobs in 1984. About 3 out of 4 worked in manufacturing, primarily in durable goods industries such as blast furnaces, basic steel, and motor vehicles and equipment; those in nondurable goods manufacturing were concentrated in industries producing paper and chemicals. Most of the rest were employed by construction firms. Although millwrights work in every State, employment is concentrated in heavily industrialized areas.

Training, Other Qualifications, and Advancement

Most millwrights start as helpers to skilled workers and learn the trade informally on the job. This process can take from 6 to 8 years. Others learn through 4-year formal apprenticeship programs that combine on-the-job training with classroom instruction. Apprenticeship programs include training in dismantling, moving, erecting, and repairing machinery. Apprentices also may work with concrete and receive instruction in related skills such as carpentry, welding, and sheet-metal work. Classroom instruction is given in shop mathemat-

A millwright is often called a "jack of all trades" because of the variety of skills the job entails.

ics, blueprint reading, hydraulics, electricity, and safety.

Applicants for apprentice or helper jobs must be at least 17 years old. Most employers prefer applicants with a high school diploma or its equivalent. Courses in science, mathematics, mechanical drawing, and machine shop practice are useful. Because millwrights often take apart complicated machinery, mechanical aptitude is important. Strength and agility also are important, because the work can require a considerable amount of lifting and climbing.

Job Outlook

Employment of millwrights is expected to increase more slowly than the average for all occupations through the mid-1990's. A slowdown in the growth of manufacturing due largely to foreign competition should result in weakening demand for millwrights. This will be offset to some degree by plant automation and modernization. Millwrights will be needed to dismantle machinery and to install and maintain new equipment. In addition, some openings will arise annually as experienced millwrights retire or transfer to other occupations.

Employment of millwrights is somewhat sensitive to changes in economic conditions. In the construction industry, for example, employment fluctuates with the level of commercial and industrial building activity. When construction activity falls, jobs are scarce and even experienced millwrights may face layoffs or shortened workweeks. They are also subject to seasonal layoff caused by snow, rain, and other bad weather conditions. Millwrights who work in manufacturing plants are not subject to seasonal layoffs and are not as likely to be laid off in downturns in the economy because, even though employers are not installing new equipment, existing machinery still needs to be maintained and repaired. Some layoffs may occur, however, and new jobseekers may find few opportunities for employment.

Earnings

Median hourly earnings of most millwrights were $12 in 1984; the middle 50 percent earned between $9.75 and $13 per hour. The lowest 10 percent earned less than $6.50, and the top 10 percent earned more than $17.60. In contrast, the average hourly wage for all nonsupervisory workers in private industry, except farming, was $8.33. Earnings for millwrights in 10 areas that represent various regions of the country appear in table 1.

Table 1. Average hourly earnings of millwrights, selected areas, 1984

Area	Hourly rate
Indianapolis	$14.66
Cleveland	14.09
Detroit	13.85
Buffalo	13.69
Kansas City	13.69
Baltimore	13.68
Milwaukee	13.63
Chicago	13.54
St. Louis	13.30
Louisville	13.09
Philadelphia	12.16
Dallas	11.16

SOURCE: Bureau of Labor Statistics.

Many millwrights belong to labor unions. Most belong to the United Brotherhood of Carpenters and Joiners of America. Others belong to the United Steelworkers of America; International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; United Paperworkers International Union; International Union of Electrical, Radio and Machine Workers; and International Brotherhood of Firemen and Oilers.

Related Occupations

To set up machinery for use in a plant, millwrights must know how to use hoisting devices, and how to assemble, disassemble, and in some cases repair machinery. Other workers with similar job duties are industrial machinery mechanics, mobile heavy equipment mechanics, aircraft mechanics and engine specialists, diesel mechanics, farm equipment mechanics, ironworkers, and machine assemblers.

Sources of Additional Information

For further information on apprenticeship programs, write to the Apprenticeship Council of your State's labor department, local offices of your State employment service, local firms that employ millwrights, or the Associated General Contractors of America, 1957 E St. NW., Washington, D.C. 20006.

Musical Instrument Repairers and Tuners

(D.O.T. 730.281-014, -025, -038, -050, -054, .361, .381-010, -026, -034, -038, -042, -058, .681-010, .684-022, -026, and -094)

Nature of the Work

Whether they are used to perform the classics or contemporary rock, musical instruments are a source of entertainment and recreation for millions of people. Maintaining these instruments so they perform properly is the job of musical instrument repairers and tuners. The five largest of these occupations are piano tuner, piano technician, pipe-organ tuner and repairer, brass instrument repairer, and wind instrument repairer.

Piano tuners adjust piano strings so that they will be in proper pitch. When a piano key is struck, a felt-covered wooden hammer strikes one or more strings, causing them to vibrate. The number of times a string vibrates in a second is called its pitch. For the piano to sound right, all its strings must be set at their proper pitch.

Tuners begin by adjusting the pitch of the "A" or "C" string. Striking the key, the tuner compares the string's pitch with that of a tuning fork. Using a tuning hammer (also called a tuning lever or wrench), the tuner turns a steel pin to tighten or loosen the string until its pitch matches that of the tuning fork. The pitch of all the other strings is set in relation to the "A" or "C" string. The standard 88-key piano has about 230 strings and can be tuned in about an hour and a half.

The sound of the piano also can be affected by problems in any of the thousands of wooden, steel, iron, ivory, and felt parts in its works. Piano technicians locate and correct these problems. Technicians also tune pianos.

To get an idea of what is wrong with the piano, technicians talk with the customer. They also may play the instrument or partially dismantle it to inspect the parts. When technicians discover the problem, they make repairs or adjustments. They may realign hammers that do not strike the strings properly or may replace worn felt or broken strings or rebuild or replace the wooden sounding board that amplifies the string's vibrations. Sometimes technicians completely rebuild pianos. To dismantle and repair pianos, technicians use common handtools as well as special ones, such as regulating, repinning, and restringing tools.

Although organs and pianos may look somewhat alike, they work differently, and few tuners and repairers work on both instruments. Moreover, people who service organs specialize in either pipe or electronic organs. Electronic organs are not included in this statement.

Pipe-organ repairers tune, repair, and install organs that make music by forcing air through one of two kinds of pipes—flue pipes or reed pipes. The flue pipe sounds when a current of air strikes a metal lip in the side of the pipe. The reed pipe sounds when a current of air vibrates a brass reed inside the pipe.

To tune an organ, repairers first match the pitch of the "A" pipes with that of a tuning fork. The pitch of other pipes is set by comparing it with that of the "A" pipes. To tune a flue pipe, the technician moves the metal slide that increases or decreases the pipe's "speaking length." To tune a reed pipe, the technician alters the length of the brass reed inside the pipe. A day or more may be needed to finish one of these jobs, because most organs have hundreds of pipes.

Like piano technicians, pipe-organ repairers must locate and correct problems in the organ's components that affect its sound. This may involve replacing worn parts of the pipes, the console, or other components. Repairers also do maintenance work, such as cleaning the pipes, on a regular schedule.

Occasionally, pipe-organ repairers assemble organs onsite in churches and auditoriums. They follow the designer's blueprints and use a variety of hand and power tools to install and connect the air chest, blowers, air ducts, pipes, and other components. Technicians may work in teams or be assisted by helpers. A job may take several weeks or even months, depending on the size of the organ.

Musical instrument repairers generally learn their trade on the job.

Violin repairers adjust and repair bowed instruments, such as violins, violas, and cellos, using a variety of handtools. They find defects by close inspection and by playing the instrument. They remove cracked or broken sections with heated knives so that the delicate instrument is not damaged. The defective parts are replaced, and the instrument is restrung. In order to restore an old or severely damaged instrument to its original condition, the repairer must fill in scratches with putty, sand the rough spots, and apply paint or varnish.

Brass and wind instruments include trumpets, cornets, tubas, clarinets, flutes, and saxophones. Brass and wind instrument repairers clean, adjust, and repair these instruments. They may move mechanical parts or play scales to find any defects in the instrument. They may unscrew and remove rod pins, keys, and pistons, and may remove soldered parts by using gas torches. These repairers remove dents in metal instruments by using mallets or burnishing tools. They fill cracks in wood instruments by inserting pinning wire into the cracks and covering them with filler.

Working Conditions

The work of musical instrument repairers and tuners is relatively safe, although they may suffer small cuts and bruises when making repairs. Work is performed in shops, music stores, homes, and public buildings, such as churches and schools, where working conditions usually are good.

Employment

Musical instrument repairers and tuners held about 9,200 jobs in 1984. Most worked on pianos. Eight of every 10 worked in music stores. Most of the rest worked in repair shops or for musical instrument manufacturers.

More than 4 out of 10 musical instrument repairers and tuners are self-employed. Most repairers and tuners work in large metropolitan areas.

Training, Other Qualifications, and Advancement

Musical instrument repairers and tuners generally learn their trade on the job. Some music stores, large repair shops, and self-employed technicians hire inexperienced people as trainees.

Trainees do general cleanup work, help move and install instruments, and do other routine tasks. Trainees tune and repair instruments under the supervision of experienced workers. Usually 2 to 5 years of training and practice are needed to become a competent musical instrument repairer.

For those people who are interested in piano tuning and repair, a small number of technical schools and colleges offer courses in piano technology that last 6 months to 2 years. Home study (correspondence school) courses in piano technology also are available. These courses emphasize practice tuning and piano repair. Graduates of these courses generally are encouraged to refine their skills by working for a time with an experienced tuner or technician. Employers generally prefer to hire workers with some knowledge of the trade.

For those who are interested in other types of instrument repair, a few music repair schools offer a 1- or 2-year course in complete overhauling and refinishing of brass, woodwind, and string instruments. Beginners may also learn these skills as apprentices under the supervision of experienced technicians.

Employers prefer high school graduates for beginning jobs in musical instrument repair. Music courses help develop the student's ear for tonal quality. Courses in woodworking also may be useful because many of the moving parts of some instruments are made of wood.

People interested in a career in these fields should have good hearing, mechanical aptitude, stamina, and manual dexterity. Because work frequently is done in the customer's home—especially piano repair—a neat appearance and a pleasant, cooperative manner also are important. Ability to play the instrument is sometimes helpful.

Musical instrument repairers keep up with new developments in their fields by studying trade magazines and manufacturers' service manuals. The Piano Technicians Guild helps its members improve their skills through training programs conducted at local chapter meetings and at regional and national seminars. Guild members also can take a series of tests to earn the title Registered Piano Tuner-Technician. The title is an acknowledgment of the technician's skills.

Repairers and technicians who work for large dealers or repair shops can advance to supervisory positions. Some people in this field, however, go into business for themselves. Opening a repair business is fairly easy because only a small investment in tools is required. Basic music instrument repair tools cost only a few hundred dollars. Because the musical instrument repair business is so competitive, training in small business management, customer relations, and accounting can mean the difference between success and failure. Self-employed tuners and repairers operate out of their own homes and use either a car or a small truck for service calls. They also may work at another job until their clientele is large enough to support a repair business.

Job Outlook

Employment of musical instrument repairers and tuners is expected to increase more slowly than the average for all occupations through the mid-1990's. Most job openings will arise from the need to replace experienced workers who transfer to other occupations, retire, or leave the occupation for other reasons. Since this is a very small occupation, the overall number of job openings will be small.

Millions of musical instruments already are in use, and the number will increase as the population grows and as people have more leisure time. The large number of instruments in use will assure a demand for repair work. However, opportunities for untrained workers in these occupations are few. Most music store owners and self-employed tuners and repairers are reluctant to train persons who do not have at least a basic understanding of instrument repair. Training such people requires time that could be more profitably spent doing tuning or repair work. Individuals who have some familiarity with the trade may find it easier to get a trainee job.

Because musical instrument tuning and repair are a luxury for most consumers, these occupations are sensitive to the downturns in the economy. During poor economic conditions, tuners and repairers may lose income because their customers put off tuning and repairing instruments. People wishing to enter the trade usually find music store owners and self-employed repairers and technicians especially reluctant to hire trainees when business is slow.

Earnings

According to the limited data available, apprentices generally earned from $8,000 to $10,000 a year in 1984; beginning repairers earned from $12,000 to $18,000. Those with several years' experience earned between $20,000 and $35,000, and highly successful musical instrument repairers often earn up to $50,000 annually. Earnings of the self-employed depend on the size of the community, their ability to attract and keep customers, their operating expenses, and the amount of competition from other tuners and repairers.

Related Occupations

Mechanical aptitude and manual dexterity are qualities that are needed in musical instrument repair. Other workers who possess these traits are electronic home entertainment equipment repairers, vending machine servicers and repairers, pinsetter mechanics, home appliance and power tool repairers, and office machine and cash register servicers.

Sources of Additional Information

Details about job opportunities may be available from local music instrument dealers and repair shops.

For general information about piano technicians and a list of schools offering courses in piano technology, write to:

Piano Technicians Guild, 9140 Ward Parkway, Kansas City, Mo. 64114.

For general information on musical instrument repair, write to:

Allied Music Corporation, P.O. Box 288, Elkhorn, Wis. 53121.

National Association of Professional Band Instrument Repair Technicians (NAPBIRT), P.O. Box 51, Normal, Ill. 61761.

Office Machine and Cash Register Servicers

(D.O.T. 633.261-014, .281 except -026; 706.381-010 and -030)

Nature of the Work

Office machine and cash register servicers maintain and repair the machines that are used to process paperwork in business and government. These machines include typewriters, adding and calculating machines, cash registers, dictating machines, postage meters, and duplicating and copying equipment. (Technicians who work on data processing equipment and word processing systems are discussed in the statement on computer service technicians presented elsewhere in the *Handbook*.)

Servicers (often called field engineers, customer engineers, or service technicians) make regular visits for preventive maintenance to the offices and stores of customers in their assigned area. The frequency of service calls depends upon the type of equipment being serviced. For example, an electric typewriter may require preventive maintenance only three or four times a year, while a complex copier probably would require more frequent attention. During these calls, the servicer inspects the machine for unusual wear and replaces any worn or broken parts. Then the machine is cleaned, oiled, and adjusted to ensure peak operating efficiency and to prevent future breakdowns. The servicer also may advise machine operators how to use the equipment more efficiently and how to spot a problem in its early stages.

Despite frequent maintenance, business machines occasionally malfunction. When notified of a breakdown, a servicer goes to the customer's place of business, examines the machine, and determines the cause of the malfunction. Minor problems generally can be corrected on the spot since many servicers carry a sufficient number of parts for such repairs; more serious problems, however, may require that a component or the entire machine be taken to the repair shop.

Minor repairs generally can be made on the spot.

Servicers generally specialize in one type of machine. Those employed by manufacturing companies or dealers usually are familiar only with the brand produced or sold by their employer. Those who work for small independent repair shops, however, must be able to work on equipment from several different manufacturers.

Servicers use common handtools, such as screwdrivers, pliers, and wrenches, as well as other tools especially designed to fit certain kinds of business machines. In addition, they use meters, oscilloscopes, and other types of testing equipment to check for malfunctions in electronic circuits.

Working Conditions

Servicing office machines and cash registers is cleaner and less strenuous than the work in most other mechanical trades. Servicers generally wear business clothes and do most of their work in the customer's office.

Servicers generally work a 5-day, 40-hour week. They travel a great deal because they usually visit a number of customers each workday. They generally use their own cars and are reimbursed on a mileage basis, but major equipment manufacturers usually provide vehicles for their workers. Injuries are uncommon.

Employment

Office machine and cash register servicers held about 53,000 jobs in 1984. Most servicers work on typewriters, calculators, copiers, and duplicators. Others service proof machines in banks, accounting-bookkeeping machines, cash registers, and postage and mailing equipment. A small number repair dictating machines.

About 8 out of 10 servicers work for wholesale distributors of business machines. The remainder work for retail establishments, independent repair shops, equipment manufacturers, and for organizations large enough to employ their own staff of full-time servicers.

Servicers work throughout the country. Even relatively small communities usually have at least one or two repair shops. Most servicers, however, work in large cities.

Training, Other Qualifications, and Advancement

The amount of formal education required for entry jobs varies. Some employers hire applicants with a high school education, while many others require at least 1 year of technical training in basic electricity or electronics. Employers agree that electronics training received in the Armed Forces is valuable.

A large proportion of job openings for office machine and cash register servicers are filled by experienced workers who transfer from other occupations, most probably from a related job where they serviced mechanical and electronic equipment.

Applicants for entry jobs may have to pass tests that measure mechanical aptitude, knowledge of electricity or electronics, manual dexterity, and general intelligence. Good eyesight, including color vision, is needed to inspect and work on small, delicate parts. Persons considering this type of work should have good hearing to detect malfunctions which may be revealed by sound.

Employers seek applicants who have a pleasant, cooperative manner. Because most machine servicing is done in customers' offices, the ability to work without interrupting the office routine is very important. A neat appearance and the ability to communicate effectively are essential.

Office machine and cash register servicers must be trustworthy because they sometimes are exposed to money and other valuables in places like banks and securities offices. Some employers require that they be bonded. They must work without direct supervision and must be able to set up maintenance schedules for their customers' equipment and arrange their own schedules so that they can meet service deadlines and also handle emergency repairs.

Trainees who work in a manufacturer's branch office or for a franchised dealer usually attend a school sponsored by the manufacturer. Training programs at company schools usually last several weeks to several months, depending on the type of machine the repairer will service. Trainees then receive from 1 to 3 years of practical experience and on-the-job training before they become fully qualified repairers. These workers generally learn to service only the company's line of equipment.

Because small repair shops usually do not specialize in the more sophisticated types of equipment, they usually offer less formal training, consisting of a self-study course plus on-the-job instruction under the supervision of an experienced worker.

Office machine and cash register servicers frequently attend training seminars sponsored by equipment manufacturers for special instruction in new business machines. They also are encouraged to broaden their technical knowledge during nonworking hours. Many companies pay the tuition for work-related courses in colleges and technical schools.

Because of their familiarity with equipment, servicers are particularly well qualified to advance to sales jobs as manufacturers' sales workers. Workers who show managerial ability also may become service managers or supervisors. Experienced workers sometimes open their own repair shops; those who work in manufacturers' branch offices may become independent dealers or buy sales franchises from the company.

Job Outlook

Employment of office machine and cash register servicers is expected to grow faster than the average for all occupations through the 1990's, as business and government buy more office equipment to handle a growing volume of paperwork. Most job openings will arise from the need to replace experienced workers who transfer to other occupations—such as computer service technician or manufacturers' sales worker—retire, or stop working for other reasons.

Employment opportunities for qualified beginners are expected to be excellent. In recent years, many technological changes have occurred in business machines. Electronic calculating machines have replaced mechanical models, for example, and electronic cash registers are linked to computers. Because of the greater use of such equipment, opportunities will be particularly favorable for servicers who have training in electronics. However, in the long run, the difference between the jobs performed by office machine servicers and computer service technicians may narrow.

Office machine and cash register servicers have steadier employment than many other skilled workers. Office machines must be maintained even when business slackens, since records must be kept, correspondence processed, and statistical reports prepared.

Earnings

Median weekly earnings of full-time office machine and cash register servicers were about $390 in 1984; the middle 50 percent earned between $300 and $540. Ten percent earned less than $240, and 10 percent earned more than $675.

In 1984, trainees started at about $200 to $275 a week, according to the limited information available. Even during training, salaries often are increased as workers advance to more complicated assignments. People who have previous electronics training in the Armed Forces or civilian technical schools generally receive somewhat higher beginning wages than high school graduates.

Experienced workers earned from $300 to $450 a week, while highly skilled specialists earned from $500 to $720. Servicers who can work on more than one type of equipment may earn substantially more than those who are familiar with only one type of machine.

In many areas, earnings for office machine and cash register servicers are comparable to those of computer service technicians with similar skills, responsibilities, and experience. (See the statement on computer service technicians, a closely related occupation, elsewhere in the *Handbook*.)

Related Occupations

Other workers who service complicated electronic and mechanical equipment include home appliance and power tool repairers, electricians, computer service technicians, instrument repairers, radar mechanics, and electronic home entertainment equipment repairers.

Sources of Additional Information

For more details about job opportunities, contact local firms that manufacture, sell, or service business machines and the local office of the State employment service. The State department of education in your State capital can furnish information about approved technical institutes, junior colleges, and other institutions offering postsecondary training in basic electronics. For general information about the work of office machine and cash register servicers, contact:

Computer and Business Equipment Manufacturer's Association, 311 First St. NW., Washington, D.C. 20001.

Vending Machine Servicers and Repairers

(D.O.T. 319.464-014 and 639.281-014)

Nature of the Work

Coin-operated vending machines have become a familiar sight in places of recreation, work, and education. These machines provide many types of refreshments, from a piece of candy to a complete meal. Vending machine servicers and repairers keep these machines in good working order.

Before new machines are placed in use, servicers make sure they operate correctly. When checking complicated electrical and electronic machines, such as beverage dispensers, they make sure that the machines mix drinks properly and that refrigerating and heating units work correctly. On the relatively simple gravity-operated machines, servicers check handles, springs, plungers, and merchandise chutes. They also test coin and change-making mechanisms. When installing machines on location, they make the necessary water and electrical connections and recheck the machines for proper operation.

If a machine breaks down, repairers must determine the cause of the trouble. They first inspect the machine for obvious problems, such as loose electrical wires, malfunctions of the coin mechanism, and leaks. If the problem cannot be readily located, they may refer to troubleshooting manuals and wiring diagrams and use testing devices such as electrical circuit testers to find defective parts. Repairers may fix faulty parts at the site, but they often install replacements and take broken parts to the company shop for repair. When servicing electronic machines, repairers may only have to replace a circuit board or other component.

Preventive maintenance—avoiding trouble before it starts—is another major job of these workers. For example, they periodically clean electrical contact points, lubricate mechanical parts, and adjust machines to perform properly.

In repair and maintenance work, repairers use pipe cutters, soldering irons, wrenches, screwdrivers, hammers, and other handtools. In the repair shop, they may use power tools, such as grinding wheels, saws, and drills as well as voltmeters, ohmmeters, oscilloscopes, and other testing equipment.

Because many vending machines dispense food, these workers must know State and local public health and sanitation standards as well as local plumbing and electrical codes.

Vending machine servicers and repairers must do some clerical work, such as filing reports, preparing repair cost estimates, and ordering parts. Those employed by small companies may also fill machines on a regular basis. These combination servicers-repairers stock machines, collect money, fill coin and currency changers, and keep daily records of merchandise distributed.

Working Conditions

Some servicers and repairers work in company repair shops, others work in the field, but many do both. Since vending machines can be operated around the clock, repairers sometimes work at night and on weekends and holidays.

Vending machine repair shops generally are quiet, well lighted, and have adequate work space. However, when servicing machines on location, the work may have to be done where pedestrian traffic is heavy, such as in a busy supermarket. Repair work is relatively safe, although repairers and servicers are subject to hazards such as electrical shocks and cuts from sharp tools and metal objects. They also must know and follow safety procedures, especially when lifting heavy objects and working with electricity and gas.

Mechanics sometimes work at night and on weekends and holidays.

Employment

Vending machine servicers and repairers held about 33,000 jobs in 1984. Most repairers work for vending companies that sell food and other items through machines. Others work for soft drink bottling companies that have their own coin-operated machines. Some work for companies who engage in operating coin-operated services such as pin-ball machines, juke boxes, and similar types of mechanical amusement equipment. Although vending machine servicers and repairers are employed throughout the country, most are located in areas with large populations where there are many coin and vending machines.

Training, Other Qualifications, and Advancement

Most vending machine repairers enter the occupation as general shop helpers or route drivers, where they learn informally on the job by observing, working with, and receiving instruction from experienced repairers. Trainees usually start out by doing simple jobs such as cleaning, painting, or refurbishing machines. They then learn to rebuild machines—removing defective parts, repairing, adjusting, and testing the machines. Next, they accompany an experienced repairer on service calls, and then go out on their own. They call upon the expertise of other repairers, when necessary. This learning process takes from 6 months to 3 years, depending on the individual's abilities, previous education, types of machines, and the quality of instruction.

Many beginners are high school graduates, but employers may not require a diploma. High school or vocational school courses in electricity, refrigeration, and machine repair help beginners to qualify for entry jobs. Some vocational high schools and junior colleges offer 1- to 2-year training programs for vending machine servicers and repairers. Many schools offer training in basic electronics, which is becoming increasingly important for these workers.

The National Automatic Merchandising Association has established an apprenticeship program to help employers train workers. These workers are recommended by their employers. Apprentices receive training in various skills including 144 hours of instruction each year in subjects such as basic electricity and electronics, blueprint reading, customer relations, and safety. Apprenticeships last 3 years. The NAMA program includes optional certification upon completion of the on-the-job training, and passing performance and written tests.

To learn about new machines, repairers and servicers sometimes attend manufacturer-sponsored training sessions in repair shops, or in manufacturers' service facilities. Employers usually pay wages and expenses during these sessions, which may last from a few days to several weeks.

Some employers encourage both trainees and experienced workers to take evening courses in subjects related to vending machine operation and repair—for example, basic electricity, electronics, and refrigeration. Employers often pay for at least part of the tuition and book expenses for these courses.

Employers require applicants to demonstrate mechanical ability, either through their work experience or by scoring well on mechanical aptitude tests. Since vending machine servicers and repairers sometimes handle thousands of dollars in merchandise and cash, employers want applicants who have a record of honesty and respect for the law. The ability to deal tactfully with people also is important. A commercial driver's license and a good driving record are essential for most coin machine repairer jobs.

Skilled servicers and repairers may be promoted to supervisory jobs. Some open their own companies.

Job Outlook

Employment of coin and vending machine servicers and repairers is expected to grow about as fast as the average for all occupations through the mid-1990's as more vending machines are installed in industrial plants, hospitals, stores, and other business establishments to meet the public demand for vending machine items as well as for the convenience of their employees. In addition, vending companies will increase the variety of products dispensed by machines. Job openings also will arise as experienced workers transfer to other occupations or leave the labor force.

Persons with some background in electronics should have excellent job prospects, because electronic components are used more and more in coin and vending machines. If firms cannot find trained or experienced workers, they are likely to train qualified route drivers or hire inexperienced people who have acquired some mechanical or electrical aptitude by taking high school or vocational courses.

Earnings

Wage rates for vending machine servicers and repairers ranged from $3.35 to $15 an hour in 1984, depending on the size of the firm and the region of the country. Apprentices start at 50 percent of the rate paid experienced workers and receive periodic increases.

Most vending machine repairers work 8 hours a day, 5 days a week, and receive premium pay for overtime. Some union contracts stipulate higher pay for nightwork and for emergency repair jobs on weekends and holidays.

Many vending machine repairers and servicers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

Related Occupations

Other workers who repair equipment with electrical and electronic components include bowling-pin-machine mechanics, home appliance and power tool repairers, laundry machine repairers, maintenance mechanics, office machine and cash register servicers, and sewing machine repairers.

Sources of Additional Information

Further information on job opportunities in this field can be obtained from local vending machine firms and local offices of the State employment or apprenticeship service. For general information and a list of schools offering courses in vending machine repair, write to:

National Automatic Merchandising Association, 20 N. Wacker Dr., Chicago, Ill. 60606.

Construction and Extractive Occupations

Construction and extractive workers make up two of the most important groups of occupations in the Nation's labor force. Construction workers build the houses that shelter the population, the factories in which the Nation's goods are produced, and also office buildings, stores, schools, roads and bridges, and water, sewer, electric power, and transportation systems. Extractive workers mine the fuels needed for heat and power and the raw materials needed in manufacturing, construction, and agriculture.

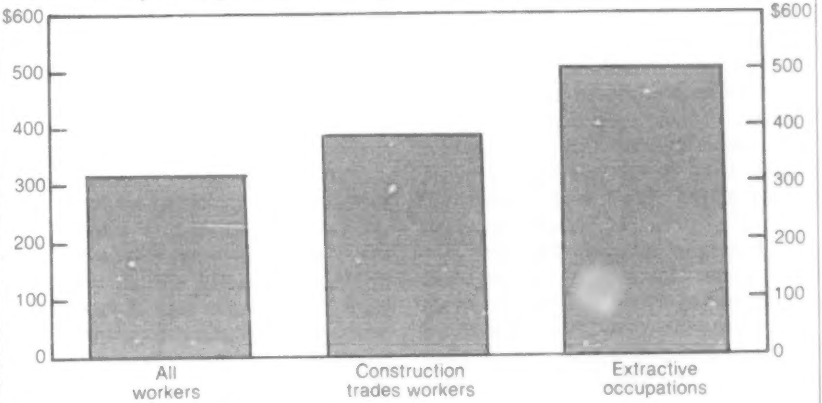
Construction, mining, and oil and gas drilling are complex operations that require workers with many kinds of skills. Construction and extractive workers accomplish their tasks using tools, machinery, and materials that frequently are peculiar to their occupation. Brickmasons work with mortar, trowels, and brick. Blasters shatter ores and stone with explosives. Although construction and extractive workers use laborsaving machinery and tools, the work in most of these occupations is physically demanding.

Workers in the construction and extractive occupations usually acquire their skills through on-the-job training. Although many employers prefer to hire high school graduates, physical strength, stamina, and mechanical aptitude often are as important as an applicant's level of education. New workers learn by doing the job under the supervision of experienced workers. For some occupations, new workers also receive classroom instruction. Electricians, for example, learn electrical theory, mathematics, and blueprint reading, and coal miners take safety classes. The type and length of training vary among the occupations. Union-management contracts frequently set the rules governing entry and training. Many construction workers, for example, learn their trades through apprenticeships administered by union-management committees.

The occupational statements in this chapter describe in detail the work, training, and job outlook for 15 construction occupations and 1 extractive occupation.

Earnings in extractive occupations and construction trades are higher than the average for all workers.

Median weekly earnings of full-time wage and salary workers, 1984



SOURCE Bureau of Labor Statistics

Construction Occupations

Construction trades workers make up one of the largest groups of skilled workers in the Nation's labor force. These trades offer good opportunities for young people who are not planning to go to college but who are willing to spend several years learning a skilled occupation. Construction workers can find jobs in all parts of the country and also have greater opportunities to open their own businesses than workers in most other skilled occupations.

What are the Construction Trades?

Workers in the construction trades build, repair, and modernize homes and other kinds of buildings. They also work on a variety of other projects, including airports, mass transportation systems, roads, recreation facilities, and powerplants.

Construction workers may be grouped into three categories: Structural, finishing, and mechanical. *Structural workers* include: Bricklayers, carpenters, concrete masons, ironworkers, construction machinery operators, stonemasons, and boilermakers. *Finishing workers* include: Drywall installers and finishers, carpet installers, glaziers, insulation workers, marble setters, painters, paperhangers, plasterers, roofers, terrazzo workers, and tilesetters. *Mechanical workers* include: Electricians, pipefitters, plumbers, sheet-metal workers, and millwrights.

Most construction trades are described individually later in this section. Boilermakers and millwrights are described elsewhere in the *Handbook*.

Working Conditions

Construction work frequently requires prolonged standing, bending, and working in cramped quarters. Exposure to weather is common since much of the work is done outdoors or in partially enclosed structures. Many people prefer construction work because it permits them to be outdoors.

Construction workers may work with sharp tools, amidst a clutter of materials or on scaffolding. As a result, they have more injuries than workers in other jobs. Indeed, construction has the highest injury and illness rate of any industry. However, employers increasingly are emphasizing safe working conditions and stressing safe work habits—practices that reduce the risk of injuries. "Hard hats," steel-toed shoes, safety belts, and nets are some of the devices that help reduce risk.

Employment

Construction trades workers, excluding supervisors, held 4 million jobs in 1984. Most were employed by contractors in the construction industry. The vast majority of construction contractors employ fewer than 10 people. A few large contractors, however, employ thousands. Many construction workers are employed in other industries to do maintenance and repair work. For example, plumbers and pipefitters maintain the complex pipe networks in chemical processing plants. Government agencies employ construction workers to maintain highways, buildings, and sanitation systems.

About 1 out of 4 skilled construction workers is self-employed and contracts with homeowners and businesses for small jobs. Self-employment is most common in paperhanging, painting, and floor covering work, but it also is found in other trades.

Employment in the construction trades is distributed geographically in much the same way as the Nation's population. It is concentrated in industrialized and highly populated areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend formal apprenticeship training as the best way to acquire the all-round skills of the construction trades. Apprenticeship is a prescribed period of on-the-job training, supplemented by related classroom instruction designed to familiarize apprentices with the materials, tools, and principles of their trade. Formal apprenticeship agreements are registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training.

Apprentices generally must be at least 18 years old and in good physical condition. A high school education or its equivalent, including courses in mathematics and mechanical drawing, is desirable. Courses in construction trades, such as carpentry and electricity, also are recommended. Often, applicants are given aptitude tests.

The formal apprenticeship agreement generally calls for 3 to 4 years of on-the-job training and 144 hours or more of related classroom instruction each year. On the job, most instruction is given by a skilled worker to whom the apprentice is assigned.

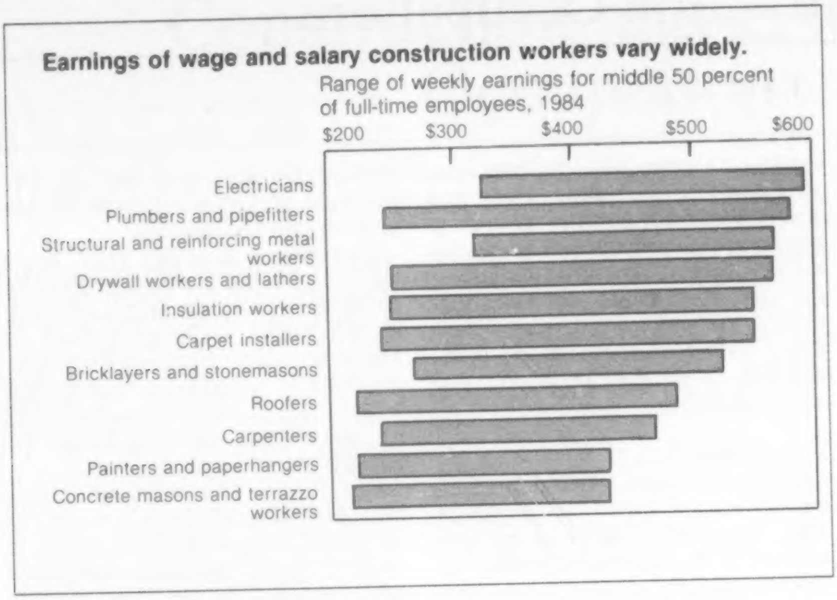
Classroom instruction usually includes courses such as history of the trade, characteristics of materials, shop mathematics, and basic construction principles.

In most communities, apprenticeship programs are supervised by joint apprenticeship committees composed of local employers and union representatives. Committees determine the need for apprentices and establish minimum standards of education, experience, and training.

In areas where these joint committees have not been established, the apprenticeship agreement is solely between the apprentice and the employer. Many people have received valuable training under these programs, but they have some disadvantages. No committee is available to supervise the training offered and settle differences over the terms and conditions of training. And, if the employer lacks continuous work or does only a restricted type of work, the apprentice may find it difficult to develop all-round skills.

Although apprenticeship provides the most thorough training, most people acquire construction skills informally by working as laborers and helpers and observing experienced workers and/or attending vocational or trade schools or by taking correspondence courses.

In many localities, some construc-


Earnings of wage and salary construction workers vary widely.

tion workers—most commonly electricians and plumbers—are required to have a license. To qualify for licenses, they must pass an examination to demonstrate a broad knowledge of the job and of State and local regulations.

Since construction requires a team effort, the ability to work well with supervisors, peers, and subordinates is vital. Manual dexterity is necessary to work quickly and accurately with trowels, hammers, chisels, levels, saws, drills, and other tools and machinery. The ability to solve mechanical and structural problems is important for many highly skilled construction trades. With guidelines from an architect, for example, a plumber might plan the layout of a plumbing system for a kitchen or bathroom to make the best use of existing plumbing and limited space. Precision, an eye for detail, the ability to picture objects from blueprints, and color discrimination also are vital.

Construction trades workers may advance in a number of ways. Many become supervisors. In most localities, small jobs are run by "working supervisors" who work along with members of their crews. On larger jobs, they just supervise. They also can become estimators for contractors. Estimators calculate material requirements and labor costs so contractors can bid on projects. Some workers advance to superintendents on large projects. Others become instructors in trade and vocational schools or sales representatives for building supply companies. A large number of construction trades workers become self-employed contractors.

Starting a small contract construction business is easier than starting a small business in many other industries. Only a moderate financial investment is needed to conduct a substantial business from one's home. However, the field is very competitive, and the rate of failure is high.

Job Outlook

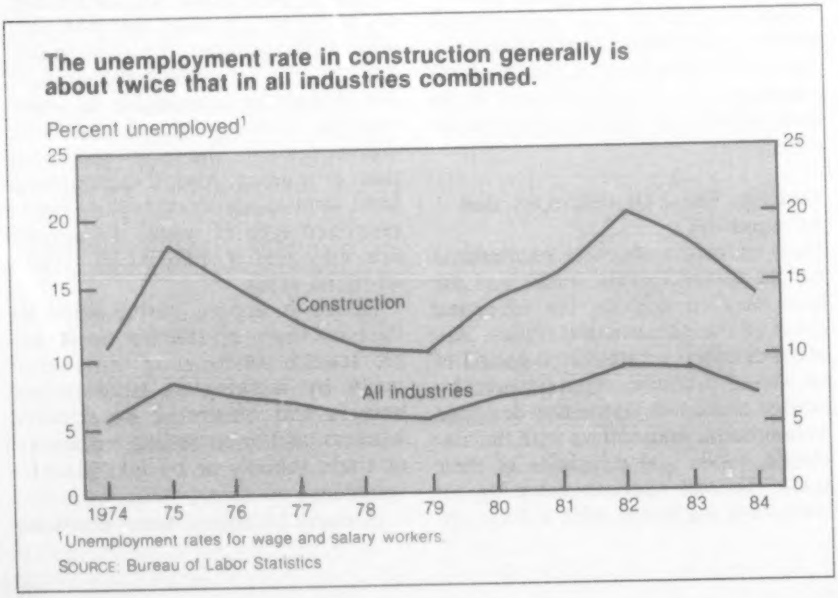
Employment in the construction trades is expected to increase about as fast as the average for all occupations through the mid-1990's. Anticipated rapid growth in business investment for new factories, office buildings, stores, hotels, powerplants, and other structures will stimulate demand for construction workers. Maintenance and repair work on all types of structures is expected to increase. Some growth also is expected in new home construction. But most job openings will result from the need to replace experienced workers who transfer to other jobs, retire, or leave the labor force for other reasons.

The increase in employment is not expected to be as great as the expansion in construction activity. Continued technological developments in construction methods, tools and equipment, materials, and material movement will raise output per worker.

The rates of employment growth will differ among the construction trades. Growth is expected to be relatively fast for construction machinery operators and concrete masons, and relatively slow for painters and paperhangers. Since construction is sensitive to changes in the Nation's economy, employment may fluctuate from year to year. Construction trades workers may be unemployed during downturns in economic activity.

Earnings

Median weekly earnings for construction trades workers, not including supervisors, were about $367 in 1984. Wage rates for apprentices and other trainees usually start at 50 percent of the rate paid to experienced workers and increase at 6-month to 1-year in-


The unemployment rate in construction generally is about twice that in all industries combined.

[1] Unemployment rates for wage and salary workers.

SOURCE: Bureau of Labor Statistics

tervals until the full rates are achieved upon the completion of training.

Wage rates generally were highest in the West and lowest in the South. Unionized workers generally earned more than nonunion workers. Except for a few trades, such as electricians and plumbers and pipefitters, yearly earnings for experienced workers and their apprentices generally are lower than weekly rates would indicate because poor weather and downturns in construction activity may limit the amount of work.

Winter is the slack period for construction activity, particularly in colder regions. Some workers, such as laborers and roofers, may find little work for several weeks in winter. Rain may also slow—even stop—work on a construction project. Because construction trades depend on one another—particularly on large projects—work delays or strikes in one trade can delay or stop the work of others. The accompanying chart shows that the unemployment rate in the construction industry is about twice that in the Nation as a whole.

A large proportion of construction workers are members of trade unions affiliated with the Building and Construction Trades Department of the AFL–CIO.

Sources of Additional Information

Information about opportunities for apprenticeship or other training can be obtained from local construction firms and employer associations, the local office of the State employment service or State apprenticeship agency, or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. For apprenticeship programs supervised by local union-management committees, application should be made directly to the committee.

For additional information on jobs in the construction trades, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Building and Construction Trades Department, AFL-CIO, 815 16th St. NW., Washington, D.C. 20006.

Home Builders Institute, Educational Arm of the National Association of Home Builders, 15th and M Sts. NW., Washington, D.C. 20005.

For the names of labor organizations and trade associations concerned with specific trades, see the discussions of individual building trades that follow.

Bricklayers and Stonemasons

(D.O.T. 779.684-058, 861.361-010 and -014, .381-010 through -042, except -034, .684-010 and -014, and 899.364-010)

Nature of the Work

Bricklayers and stonemasons work in closely related trades, each producing attractive, durable surfaces. Bricklayers build walls, floors, partitions, fireplaces, and other structures with brick, cinder or concrete block, and other masonry materials. They also install firebrick linings in industrial furnaces. Stonemasons build stone walls as well as set stone exteriors and floors. They work with two types of stone—natural cut, such as marble, granite, and limestone; and artificial stone made from cement, marble chips, or other masonry materials. Because stone is expensive, stonemasons work mostly on high-cost buildings, such as churches, hotels, and office buildings.

In putting up a wall, bricklayers usually use plumblines and a level to build the corners. They then stretch a line from corner to corner to guide each course or layer of brick. Bricklayers spread a bed of mortar (cement mixture) with a trowel (a flat, metal tool with a handle), place the brick on the mortar bed, and then tap it into place. As blueprints specify, they cut bricks with a hammer and chisel to fit around windows, doors, and other openings. Mortar joints are finished with jointing tools to leave a neat and uniform appearance. Although bricklayers generally use steel supports at window and door openings, they sometimes build brick arches that enhance the beauty of the brickwork.

Bricklayers are assisted by hod carriers, or helpers, who supply bricks and other materials, mix mortar, and set up and move scaffolding. (See the statement on construction trades helpers that appears elsewhere in the *Handbook*.)

Stonemasons often work from a set of drawings in which each stone has been numbered for identification. Helpers may locate and bring the prenumbered stones to the masons. A derrick operator using a hoist may be needed to lift large pieces into place.

When building a stone wall, masons set the first course of stones into a shallow bed of mortar. They align the stones with plumblines and levels, and adjust them into position with a hard rubber mallet. Masons build the wall by alternating layers of mortar and stone. As the work progresses, they fill the joints between stones and use a pointed metal tool, called a tuck pointer, to smooth the mortar to an attractive finish. To hold large stones in place, stonemasons attach brackets to the stone and weld or bolt them to anchors within the wall. Finally, masons wash the stone with a cleansing solution to remove stains and dry mortar.

When setting stone floors, which often consist of large and heavy pieces of stone, masons first trowel a layer of damp mortar over the surface to be covered. Using crowbars and hard rubber mallets for aligning and leveling, they then set the stone in the mortar bed. To finish, workers fill the joints and wash the stone slabs.

To make various shapes and sizes, masons use a special hammer to cut each stone along the grain. Valuable pieces often are cut with a saw that has a diamond blade.

Some masons specialize in setting marble which, in many respects, is similar to setting large pieces of other types of stone. Bricklayers and stonemasons also repair imperfections and cracks or replace broken or missing masonry units in walls and floors.

Refractory repairers or masons are bricklayers who install firebrick and refractory tile in high-temperature boilers, furnaces, cupolas, ladles, and soaking pits in industrial establishments. Many work in steel mills, where molten materials flow on refractory beds from furnaces to rolling machines.

Many masons are qualified to work with a variety of materials and, in areas that experience little demand for full-time stone and marble masons, bricklayers also will install these materials.

Working Conditions

Bricklayers and stonemasons usually work outdoors. They stand, kneel, and bend for long periods and may have to lift heavy materials. They also are subject to injuries from tools and falls from scaffolds. However, these workers are less likely to be injured than other construction workers.

The work of a bricklayer involves constant bending and lifting.

Employment

Bricklayers and stonemasons held about 140,000 jobs in 1984. The vast majority were bricklayers. Workers in these crafts are employed primarily by special trade, building, or general contractors. Some work in industrial plants. A relatively small number of bricklayers work for government agencies or businesses that do their own construction and alteration.

Workers in these trades are employed throughout the country but, like the general population, are concentrated in metropolitan areas.

About 1 out of 4 bricklayers and stonemasons is self-employed. Many of the self-employed specialize in contracting on small jobs such as patios, walks, and fireplaces.

Training, Other Qualifications, and Advancement

Most bricklayers and some stonemasons pick up their skills informally by working as helpers or hod carriers and by observing and learning from experienced workers. The remainder learn their skills through apprenticeship, which generally provides the most thorough training.

Individuals who learn the trade informally usually start as helpers or laborers. They carry materials, move scaffolds, and mix mortar. When the opportunity occurs, they are taught to spread mortar, lay brick, block, or set stone. As they gain experience, they make the transition to full-fledged craft workers. The learning period generally lasts much longer than an apprenticeship program, however.

Apprenticeships for bricklayers and stonemasons usually are sponsored by local contractors or by local union-management committees. The apprenticeship program requires 3 years of on-the-job training in addition to 144 hours of classroom instruction each year in subjects such as blueprint reading, mathematics, layout work, and sketching. Apprentices learn the general applications of brick, marble, and other stone.

Apprentices often start by working with laborers, learning the basics of supplying materials, mixing mortar, and building scaffolds. This period generally lasts about a month and familiarizes them with job routines and materials. Next, they learn to lay, align, and join brick and block. Apprentices often learn to work with stone, plaster, and concrete. Subsequently, they may be certified to work with more than one masonry material.

Applicants for apprenticeships must be at least 17 years old and in good physical condition. A high school education is preferable, with courses in mathematics, mechanical drawing, and shop.

Experienced workers can advance to supervisory positions or become estimators. They also can open contracting businesses of their own.

Job Outlook

Employment of bricklayers and stonemasons is expected to grow as fast as the average for all occupations through the mid-1990's. Population and business growth will create a need for new homes, factories, offices, and other structures. Also stimulating demand will be the increasing use of brick for decorative work on building fronts and in lobbies and foyers. The use of brick and cinder or concrete block as building materials is growing, particularly for interior load-bearing walls and sidewalks, and will add to overall employment needs. Employment of bricklayers who specialize in refractory repair may grow more slowly because the primary metal industries, where these workers are concentrated, are not expected to grow as fast as other sectors.

Although many jobs will be created by an increase in demand for these workers, most openings will result from the need to replace bricklayers and stonemasons who retire, transfer to other occupations, or leave the trades for other reasons.

Employment of bricklayers and stonemasons, like that of many other construction workers, is sensitive to changes in the economy. When the level of construction activity falls, workers in these trades can experience periods of unemployment.

Earnings

Median weekly earnings for bricklayers and stonemasons were about $380 in 1984. The middle 50 percent earned between $270 and $525 weekly. The highest 10 percent earned more than $650 weekly.

Limited information indicates that nonunion rates for experienced workers were less than union rates. However, annual earnings for workers in these trades generally are lower than weekly earnings would indicate because poor weather and downturns in construction activity limit the time they can work.

In each trade, apprentices or helpers start at about 50 percent of the wage rate paid to experienced workers. The rate increases as they gain experience.

A large number of bricklayers and stonemasons are members of the International Union of Bricklayers and Allied Craftsmen.

Related Occupations

Bricklayers and stonemasons combine a thorough knowledge of brick, stone, and marble with manual skill to erect very attractive yet highly durable structures. Workers in other occupations involving similar skills include concrete masons, plasterers, terrazzo workers, and tilesetters.

Sources of Additional Information

For details about apprenticeships or other work opportunities in these trades, contact local bricklaying, stonemasonry, or marble setting contractors; a local of the union listed above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of either bricklayers or stonemasons, contact:

International Union of Bricklayers and Allied Craftsmen, International Masonry Institute, Apprenticeship and Training, 815 15th St. NW., Washington, D.C. 20005.

best copy ava

Information about the work of bricklayers also may be obtained from:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Brick Institute of America, 1750 Old Meadow Rd., McLean, Va. 22102.

Carpenters

(D.O.T. 860.281-010 through .684-014 except .381-010, .664-014, and -018, 863.684-010, and 869.361-018,.381-010, and -034)

Nature of the Work

Almost all construction projects employ carpenters, the largest group of building trade workers. Carpenters perform a variety of jobs. In home building, carpenters build the house framework, frame the roof and interior partitions, and install doors, windows, flooring, cabinets, wood paneling, and molding and trim. Other construction jobs done by carpenters include building forms for placing concrete, erecting scaffolding, and building bridges, piers, trestles, tunnel supports, temporary shelters, and cofferdams.

The duties of carpenters vary by type of employer. A carpenter employed by a special trade contractor, for example, may specialize in setting forms for concrete construction, while one who is employed by a general building contractor may perform many tasks, such as framing walls and partitions, putting in doors and windows, and installing paneling. Although each carpentry task is somewhat different, most tasks involve the following steps.

Working from blueprints, instructions from supervisors, or both, carpenters first do the layout—measuring, marking, and arranging materials according to the plan. Local building codes often dictate where certain materials can and cannot be used, and carpenters have to know these requirements. Carpenters cut and shape materials, such as wood, plastic, fiberglass, and drywall with hand and power tools, such as chisels, planes, saws, and drills. Carpenters then join the materials with nails, screws, or glue. They check the accuracy of their work with levels, rules, and framing squares. Carpenters may work in teams or be assisted by a helper.

In all assignments, carpenters must work quickly, accurately, and economically. Taking too much time can delay other steps in the project, and careless mistakes waste time and materials.

Some carpenters are employed outside the construction industry in installation and maintenance work. For example, school districts employ carpenters to replace glass, ceiling tiles, and doors, and to repair desks, cabinets, and other furniture. Some work in industries which manufacture products made of wood, such as prefabricated houses, boats, and furniture. Other carpenters may install partitions, doors, and windows; replace glass; change locks; and assist in moving or installing machinery in factories. (Millwrights who usually install machinery are discussed elsewhere in the Handbook.)

Working Conditions

As in other building trades, the work is active and sometimes strenuous. Prolonged standing, climbing, and kneeling often are necessary. Carpenters risk injury from slips or falls, from contact with sharp or rough materials, and from the use of sharp tools and power equipment. Many carpenters work outdoors.

Some carpenters change employers each time they finish a construction job. Others alternate between working for a contractor and working as contractors themselves on small jobs.

Employment

Carpenters held about 932,000 jobs in 1984. Most carpenters work for contractors who construct, remodel, or repair buildings and other structures. Some work for government agencies, utility companies, and manufacturing firms. About 1 out of 3 is self-employed.

Carpenters are employed throughout the country in almost every community.

Training, Other Qualifications, and Advancement

Carpenters learn their trade through on-the-job training and through formal training programs. Many pick up skills informally by working under the supervision of experienced workers. Some acquire skills through vocational education. Others participate in employer training programs or apprenticeships.

Most training authorities recommend an apprenticeship as the best way to learn carpentry. Because the number of apprenticeship programs is limited, however, only a small proportion of carpenters learn their trade through these programs.

Apprenticeship programs are administered by local chapters of the Associated Builders and Contractors, Inc., and local chapters of the Associated General Contractors, as well as by local joint union-management committees of the United Brotherhood of Carpenters and Joiners and the Associated General Contractors or the National Association of Home Builders. The programs consist of on-the-job training and related classroom instruction. Apprenticeship applicants generally must be 17 years old and meet local requirements. For example, some locals test an applicant's aptitude for carpentry. The length of the program, usually about 3 to 4 years, varies with the apprentice's skill.

On the job, apprentices learn elementary structural design and become familiar with common carpentry jobs such as form building, rough framing, and outside and inside finishing. They also learn to use the tools, machines, equipment, and materials of the trade. Apprentices receive classroom instruction in safety, first aid, blueprint reading and freehand sketching, basic mathematics, and different carpentry techniques. Both in the classroom and on the job, they learn the relationship between carpentry and the other building trades.

Informal on-the-job training usually is less thorough than an apprenticeship. The degree of training and su-

Carpenters need general mathematics skills.

pervision often depends on the size of the employing firm. A small contractor who specializes in homebuilding may only provide training in rough framing. In contrast, a large general contractor may provide training in several carpentry skills.

A high school education is desirable, including courses in carpentry, shop, mechanical drawing, and general mathematics. Manual dexterity, eye-hand coordination, good physical condition, and a good sense of balance are important. The ability to solve arithmetic problems quickly and accurately is helpful. Working well with others is an important asset.

Carpenters may advance to carpentry supervisors or general construction supervisors. Carpenters usually have greater opportunities than most other construction workers to become general construction supervisors because they learn more about the entire construction process in their work. Some carpenters become independent contractors.

Job Outlook

Employment of carpenters is expected to increase as fast as the average for all occupations through the mid-1990's. Construction activity should increase in response to demand for new housing and industrial plants, and the need to renovate and modernize existing structures.

In addition to the jobs resulting from increased demand for carpenters, many openings will occur as carpenters transfer to other occupations or leave the labor force. The total number of job openings for carpenters each year usually is greater than for other craft occupations because the occupation is large and turnover is high. Since there are no strict training requirements for entry, many people with limited skills take jobs as carpenters but eventually leave the occupation because they find they dislike the work or cannot find steady employment.

Although employment of carpenters is expected to grow over the long run, people entering the occupation should expect to experience periods of unemployment. This results from the short-term nature of many construction projects and the cyclical nature of the construction industry. Building activity depends on many factors—interest rates, availability of mortgage funds, government spending, and business investment—that vary with the state of the economy. During economic downturns, job openings for carpenters are reduced. The introduction of new and improved tools, equipment, techniques, and materials has vastly increased carpenters' versatility. Therefore, carpenters with all-round skills will have better opportunities than those who can only do relatively simple, routine tasks.

Job opportunities for carpenters also vary by geographic area. Construction activity parallels the movement of people and businesses and reflects differences in local economic conditions. Therefore, the number of job opportunities in a given year may fluctuate widely from area to area.

Earnings

Median weekly earnings of carpenters who were not self-employed were $325 in 1984. The middle 50 percent earned between $245 and $470 per week. Weekly earnings for the top 10 percent of all carpenters were more than $620.

Annual earnings, however, may be lower than weekly earnings would indicate, because carpenters lose worktime in bad weather and when jobs are unavailable. Maintenance carpenters, who generally have more steady employment, averaged $11.92 an hour in 1984, according to a survey of selected metropolitan areas.

Apprentices usually start at about 50 percent of the rate paid to experienced carpenters and receive an increase of about 5 percent every 6 months.

A large proportion of carpenters are members of the United Brotherhood of Carpenters and Joiners of America.

Related Occupations

Carpenters are skilled construction workers. Workers in other skilled construction occupations include bricklayers, concrete masons, electricians, pipefitters, plasterers, plumbers, stonemasons, and terrazzo workers.

Sources of Additional Information

For information about carpentry apprenticeships or other work opportunities in this trade, contact local carpentry contractors, a local of the union mentioned above, a local joint union-contractor apprenticeship committee, or the nearest office of the State employment service or State apprenticeship agency.

For general information about this trade, contact:

Associated Builders and Contractors, Inc., 729 15th St. NW., Washington, D.C. 20005.

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Home Builders Institute, Educational Arm of the National Association of Home Builders, 15th and M St. NW., Washington, D.C. 20005.

United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, D.C. 20001.

Carpet Installers

(D.O.T. 864.381-01)

Nature of the Work

Carpet installers lay carpets or rugs in homes, offices, and commercial establishments such as restaurant and stores. Installers first inspect the floor to determine its condition. Then they plan the layout after allowing for expected traffic patterns and, if necessary, for seams so that best appearance and long wear will be obtained.

For wall-to-wall carpet, installers lay and tack an underlay—a foam rubber pad 1/4 to 1/2 inch thick that is cut slightly smaller than the entire floor. Next, they roll out, measure, mark, and cut the carpet, allowing for 3 to 4 inches of extra carpet on each side. This provides some leeway for the final fitting. Workers then lay the carpet and stretch it to fit evenly against the floor and snugly against each wall and door threshold. With the carpet stretched, the excess around the perimeter is cut to fit the room precisely. To hold the carpet in place, workers either tack or tape each edge of the carpet to the floor.

Because most carpet comes in standard 12-foot widths, wall-to-wall installations in large rooms require that the sections be joined. To do this, installers either hand-sew seams with a large needle and special thread or heat-tape seams with a hot, flat iron to melt the plastic surface of a foil-backed tape placed beneath the joined sections of carpet. Sections of carpet placed edge to edge are pressed to the surface of the melted plastic to force it into the carpet's backing. When cooled, the hardened plastic joins the sections.

For precut, edge-bound carpet, installers simply lay a foam rubber pad on the floor and roll the carpet over the slightly smaller pad. To hold the pad and carpet in place, installers may apply tape that has adhesive on both sides to the bottom edges of the carpet.

Carpet installers use common handtools, such as hammers, drills, staple guns, and rubber mallets. They also use other tools that are designed specifically for laying carpet, such as carpet knives, knee kickers, and power stretchers.

Working Conditions

Installers work under better conditions than most other construction workers. Because carpets are finished products designed almost exclusively for interior use and display, work areas usually are clean, safe, and comfortable.

Installers generally work regular daytime hours. Particular circumstances, however, such as installing carpeting in a store or office, may require work during evenings and weekends.

On the job, installers kneel, reach, bend, stretch, and frequently lift heavy rolls of carpet, activities that require strength and stamina. They also must drill, cut, hammer, and use hot irons. Despite continual movement and frequent use of hand and power tools, installers experience fewer injuries than most other construction workers.

Employment

Carpet installers held about 71,000 jobs in 1984. Most worked for flooring contractors. Many others worked for retailers of floor covering. Over one-half of carpet installers are self-employed, a much higher proportion than the average for all construction occupations.

Installers are employed throughout the Nation, but are concentrated in urban areas that have high levels of construction activity.

Training, Other Qualifications, and Advancement

The vast majority of carpet installers learn their trade informally on the job by working as helpers to experienced installers. Others learn through formal apprenticeship programs, which include on-the-job training as well as related classroom instruction.

Informal training programs usually are sponsored by individual contractors and generally last about 1 1/2 to 2 years. Helpers begin with simple assignments, such as installing tackless stripping and padding, and helping stretch newly installed carpet. With experience, helpers take on more difficult assignments, such as measuring, cutting, and fitting the materials to be installed.

Apprenticeship programs and some contractor-sponsored programs provide comprehensive training in all phases of carpet laying.

Applicants for helper or apprentice jobs should be at least 16 years old, have manual dexterity, and be mechanically inclined. Since trainees often are required to drive company vehicles, employers prefer individuals who are licensed to drive and who have good driving records. Employers also want individuals who will be courteous, tactful, and an asset in their dealings with customers. A high school education also is preferred, though not necessary. Courses in general mathematics and shop may provide a helpful background.

Carpet installers may advance to supervisors or installation managers for large floor laying firms. Some installers become salespersons or estimators. Installers also may go into business for themselves.

Job Outlook

Employment of carpet installers is expected to grow about as fast as the average for all occupations through the mid-1990's. Employment is expected to keep pace with the expected expansion in construction and the widespread use of carpeting. Because many new buildings and houses have plywood rather than hardwood floors, wall-to-wall carpet will be a necessity. Carpet also will continue to be used extensively in renovation work. Moreover, new fabrics and colors will contribute to the growing demand for this type of floor covering. In addition to job openings resulting from growth in demand for carpet installers, additional openings will arise as experienced installers transfer to other occupations or leave the labor force.

This occupation is less sensitive to changes in economic conditions than most other construction crafts. Because much of their work is done in existing buildings, employment generally remains stable even when construction activity declines.

Over one-half of carpet installers are self-employed.

Earnings

Median weekly earnings for full-time carpet installers were about $300 in 1984. One-half earned between $240 and $550 a week; the top 10 percent earned over $700. Starting wage rates for apprentices and other trainees usually are about half of the experienced worker's rate.

Most installers are paid by the hour. In some shops, part of the pay may be in bonuses. In others, installers receive a monthly salary or are paid according to the amount of work they do.

Some installers belong to the United Brotherhood of Carpenters and Joiners of America, or the International Brotherhood of Painters and Allied Trades.

Related Occupations

Carpet installers skillfully combine strength and stamina with an eye for accuracy and an appreciation for detail to produce attractively laid carpet. Workers in other occupations involving different products but which require similar skills include resilient floor layers, appliance repairers, lathers, painters, riveters, and roofers.

Sources of Additional Information

For details about apprenticeships or work opportunities, contact local flooring contractors or retailers; locals of the unions previously mentioned; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of carpet installers, contact:

Carpet and Rug Institute, P.O. Box 2048,
Dalton, Ga. 30720.

Concrete Masons and Terrazzo Workers

(D.O.T. 844.364-010, -014, .461-010, .684-010; and 861.381-046, and -050)

Nature of the Work

Concrete masons place and finish concrete—a mixture of portland cement, sand, gravel, and water—for many types of construction projects. The projects range from small jobs such as patios and floors, requiring a mason assisted by one or two laborers, to huge dams or miles of concrete highway requiring a crew of several masons and many laborers. Among other tasks, concrete masons may color concrete surfaces, expose aggregate (small stones) in walls and sidewalks, or fabricate concrete beams, columns, and panels.

Terrazzo workers create attractive walkways, floors, patios, and panels by exposing marble chips and other fine aggregates on the surface of finished concrete. However, much of the preliminary work of terrazzo workers is similar to that of concrete masons.

In preparing a site for placing concrete, masons make sure the forms for holding the concrete are set for the desired pitch and depth and are properly aligned. Masons direct the placing of the concrete and supervise laborers who use shovels or special tools to spread the concrete. Masons then guide a straightedge back and forth across the top of the forms to level the freshly poured concrete.

A troweling machine greatly increases the productivity of concrete masons.

Immediately after leveling the concrete, masons carefully sweep the concrete surface with a a long-handled tool about 8 by 48 inches to cover coarser materials and bring a rich mixture of concrete to the surface.

After the concrete becomes firm and workable, finishers press an edger between the forms and the concrete and guide it along the edge and the surface. This produces slightly rounded edges and helps prevent chipping or cracking. Finishers use a special tool to make joints or grooves that help control surface cracking.

Next, finishers trowel the surface with a powered trowel or by hand with a small, smooth, rectangular metal tool. This troweling embeds the heavier material deeper into the concrete, removes most imperfections, and brings the finer material—sand and cement—to the surface.

As the final step, masons may sweep the concrete surface back and forth with powered and hand trowels to create a smooth finish. For a coarse, nonskid finish, masons brush the surface with a broom or stiff bristled brush. For a pebble finish, they embed small gravel chips into the surface. They then wash any excess cement from the exposed chips with a mild acid solution. For color, they sprinkle on a dye which they work into the surface with float and trowel.

On concrete surfaces that will remain exposed after forms are stripped, such as columns, ceilings, and wall panels, concrete masons chisel away high spots and loose concrete, fill any large indentations with a mortar mixture, and smooth the surface with a rubbing brick. Finally, they coat the exposed area with a rich cement mixture using either a special tool or a coarse cloth to rub the concrete to a uniform finish.

Attractive, marble-chipped terrazzo requires three layers of materials. First, concrete masons or terrazzo workers build a solid, level concrete foundation that is 3 to 4 inches deep. After the forms are removed from the foundation, workers place a 1-inch deep mixture of sandy concrete. Before this layer sets, terrazzo workers partially embed metal ferrule strips into the concrete wherever there is to be a joint or change of color in the terrazzo. These strips separate the different designs and colors of the terrazzo panels and help prevent cracks.

For the final layer, terrazzo workers blend and pour a fine marble chip mixture that may be color-dyed into each of the panels, then hand trowel each panel until it is level with the tops of the ferrule strips. While the mixture is soft, workers toss additional marble chips of various colors into each panel and roll a lightweight roller over the entire surface.

When the terrazzo is thoroughly dry, helpers grind it with a terrazzo grinder (somewhat like a floor polisher, only much heavier). Slight depressions left by the grinding are filled with a matching grout material and hand troweled for a smooth, uniform surface. Terrazzo workers then clean, polish, and seal the dry surface for a rich, lustrous finish.

Working Conditions

Concrete or terrazzo work is fast paced and strenuous. Since most finishing is done at floor level, workers must bend and kneel. Some jobs are outdoors; however, work generally is halted during rain or freezing weather. To avoid chemical burns from uncured concrete and sore knees from frequent kneeling, many workers wear kneepads. Workers usually wear water-repellent boots to protect their shoes while working in wet concrete.

Employment

Concrete masons and terrazzo workers held about 105,000 jobs in 1984; terrazzo workers accounted for a very small proportion of this group. Most concrete masons work for contractors who do only concrete work or for general contractors who construct projects such as highways or large buildings. A small number are employed by municipal public works departments and firms that manufacture concrete products. Most terrazzo workers work for special trade contractors who install decorative floors and wall panels.

About 1 out of 10 concrete masons and terrazzo workers is self-employed, a smaller proportion than in other building trades. Most self-employed masons specialize in small jobs, such as driveways, sidewalks, and patios.

Training, Other Qualifications, and Advancement

Concrete masons and terrazzo workers learn their trades either through on-the-job training as helpers or through 2- or 3-year apprenticeship programs. Many masons first gain experience as construction laborers.

On-the-job training programs consist of informal instruction from experienced workers in which helpers learn to use the tools, equipment, machines, and materials of the trade. They begin with tasks such as edging and jointing and using a straightedge on freshly placed concrete. As they advance, assignments become more complex, and trainees usually can do finishing work within a short time.

Two- and 3-year apprenticeship programs, usually jointly sponsored by local unions and contractors, provide on-the-job training in addition to 144 hours of classroom instruction each year. A written test and a physical exam may be required. In the classroom, apprentices learn applied mathematics and safety. Apprentices generally receive special instruction in layout work and estimating costs.

When hiring helpers and apprentices, employers prefer high school graduates who are at least 18 years old, in good physical condition, and licensed to drive. The ability to get along with others also is important because concrete masons work in groups. High school courses in shop mathematics and blueprint reading or mechanical drawing provide a helpful background.

Experienced concrete masons or terrazzo workers may advance to supervisors or contract estimators. Some open concrete contracting businesses.

Job Outlook

Employment of concrete masons and terrazzo workers is expected to grow about as fast as the average for all occupations through the mid-1990's. As the population and the economy grow, more masons will be needed to help build apartments, highways, offices, industrial buildings, and other structures. The greater use of concrete as a building material—particularly in nonresidential construction—also will add to the demand for these workers. Prestressed concrete columns and beams, for example, are increasingly replacing structural steel in large buildings. Although many job openings will be created by increased demand for these workers, most openings will arise as experienced workers transfer to other occupations or leave the labor force.

Employment of concrete masons and terrazzo workers, like that of many other workers, is sensitive to ups and downs in the economy. Workers in these trades can experience periods of unemployment when the level of nonresidential building falls. On the other hand, temporary shortages of these workers may occur in some areas during peak periods of building activity.

Earnings

Median weekly earnings for concrete masons were about $365 in 1984. The middle 50 percent earned between $245 and $550 weekly. Nonunion workers generally have lower wage rates than union workers. Apprentices usually start at 50 to 60 percent of the rate paid to experienced workers.

Annual earnings for concrete masons and terrazzo workers generally are lower than weekly rates would indicate because work time is lost when jobs are unavailable or weather is bad.

Concrete masons often work overtime, with premium pay, because once concrete has been poured, the job must be completed without delay.

Many concrete masons and terrazzo workers belong to the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or to the International Union of Bricklayers and Allied Craftsmen.

Related Occupations

Concrete masons and terrazzo workers combine skill with knowledge of building materials to construct buildings, highways, and other structures. Other occupations involving similar skills and knowledge include bricklayer, form builder, marble setter, ironworker, plasterer, stonemason, and tilesetter.

Sources of Additional Information

For information about apprenticeships and work opportunities, contact local concrete or terrazzo contractors; locals of unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about concrete masons and terrazzo workers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

International Union of Bricklayers and Allied Craftsmen, International Masonry Institute, Apprenticeship and Training, 815 15th St. NW., Washington, D.C. 20005.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

Portland Cement Association, 5420 Old Orchard Rd., Skokie, Ill. 60077.

National Terrazzo and Mosaic Association, 3166 Des Plaines Ave., Des Plaines, Ill. 60018.

Drywall Workers and Lathers

(D.O.T. 842.361-010 and -014, .381-010, .664-010, and .681-010; and 869.684-050)

Nature of the Work

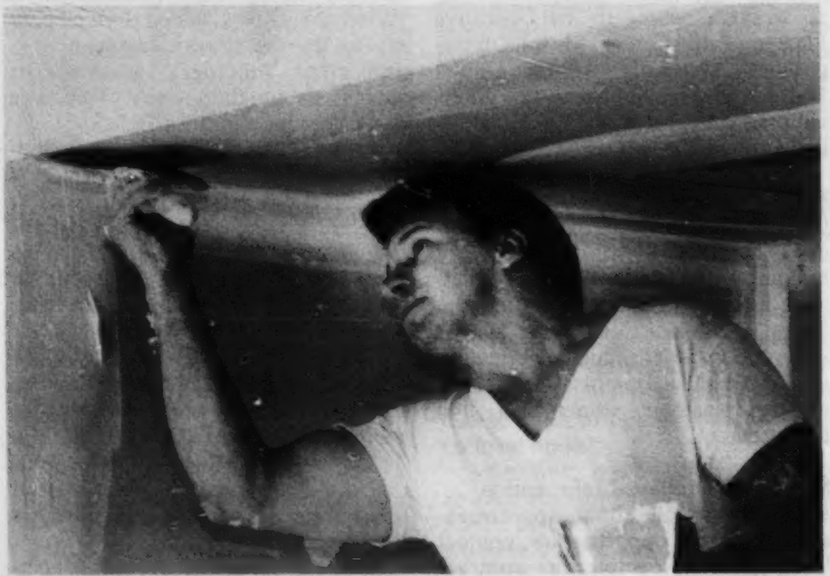
Developed as a substitute for wet plaster, drywall consists of a thin layer of plaster sandwiched between two pieces of heavy paper. It is used today for walls and ceilings of most buildings because it saves both time and money compared to traditional construction using plaster.

Two occupations have emerged from the widespread use of this construction material: Drywall installers and drywall finishers. Installers, also called applicators, fasten drywall panels to the framework inside houses and other buildings. Finishers, or tapers, do touchup work to prepare panels for painting.

Because drywall panels are manufactured in standard sizes—usually 4 feet by 8 or 12 feet—installers must measure and cut some pieces to fit around doors and windows. They also saw or cut holes in panels for electric outlets, air-conditioning units, and plumbing. After making these alterations, installers may glue, nail, or screw the wallboard panels to the wood or metal framework. Because drywall is heavy and cumbersome, a helper assists the installer in positioning and securing the panel. When placing ceiling panels, a lift often is used to assist the crew.

After installing the drywall, finishers fill joints between panels with a joint compound. Using the wide, flat tip of a special trowel, and brushlike strokes, they spread the joint compound into and along each side of the joint. Immediately, finishers use trowels to press a perforated paper tape into the wet compound and to scrape away excess material. Nail and screw depressions also are covered with this compound. On large commercial projects, finishers may use automatic taping tools to apply the joint compound and tape in one step. Finishers apply second and third coats to fill any depressions and to make a smooth surface. Sanding makes patched areas as smooth as the rest of the wall surface. Some finishers apply textured surfaces to walls and ceilings with trowels, brushes, or spray guns. Finishers also repair imperfections caused by the installation of air-conditioning vents and other fixtures. Some finishers specialize in sanding, taping, or repair work.

Lathers, an occupation involving similar work, apply metal or gypsum lath to walls, ceilings, or ornamental frameworks to form the support base for plaster coatings. Gypsum lath is similar to drywall panels, but smaller. Metal lath is used where the plaster application will be exposed to weather or water, or for curved or irregular surfaces in which drywall is not a practical material. Lathers usually nail, screw, staple, or wire-tie the lath directly to the structural framework.



Drywall finishers apply compound to cover taped joints.

Working Conditions

As in other construction trades, drywall and lathing work sometimes is strenuous. Applicators, tapers, and lathers spend most of the day on their feet, either standing, bending, or squatting. Installers have to lift and maneuver heavy panels. Hazards include the possibility of falls from ladders and scaffolds, and injuries from power tools. Because sanding joint compound to a smooth finish may create a great deal of dust, some finishers wear masks for protection.

Employment

Drywall workers and lathers held about 105,000 jobs in 1984. Most worked for contractors who specialize in drywall or lathing installation; others worked for contractors who do all kinds of construction.

Most installers, finishers, and lathers are employed in urban areas. In other areas, where there may not be enough work to keep a drywall worker or lather employed full time, the work is usually done by carpenters and painters.

Training, Other Qualifications, and Advancement

Most drywall and lathing workers start as helpers and learn most of their skills on the job. Installer and lather helpers start by carrying materials, lifting and holding panels, and cleaning up debris. Within a few weeks, they learn to measure, cut, and install materials. Eventually, they become fully experienced workers.

Finisher helpers begin by taping joints and touching up nail holes and scrapes. They soon learn to install corner guards and to conceal openings around pipes. Near the end of their training, both applicator helpers and taper helpers learn to estimate costs of installing and finishing drywall.

Some installers and lathers learn their trade in an apprenticeship program. The United Brotherhood of Carpenters and Joiners of America, AFL–CIO, in cooperation with local contractors, administers an apprenticeship program in carpentry that includes instruction in drywall and lath installation. In addition, local affiliates of the Associated Builders and Contractors conduct a similar training program for nonunion workers. The International Brotherhood of Painters and Allied Trades conducts a 2-year apprenticeship program for drywall finishers.

Employers prefer high school graduates who are in good physical condition, but they frequently hire applicants with less education. High school or vocational school courses in carpentry provide a helpful background for drywall work. Installers must be good at simple arithmetic.

Drywall workers and lathers with a few years' experience and leadership ability may become supervisors. Some workers start their own contracting businesses.

Job Outlook

Employment of drywall workers and lathers is expected to grow about as fast as the average for all occupations through the mid-1990's as the level of construction activity increases. Employment should grow faster in commercial construction than in residential construction. Besides workers hired to fill openings arising from increased demand, many will be needed to replace those who take jobs in other occupations or leave the labor force.

Drywall installation, finishing, and lathing are usually completed indoors. Unlike some other construction trades, these workers seldom lose time because of bad weather. However, they may be unemployed between construction projects and during downturns in construction activity.

Earnings

Median weekly earnings for drywall workers and lathers were about $400 in 1984. The middle 50 percent earned between $250 and $570 weekly. Trainees start at about half the rate paid to experienced workers.

Some contractors pay these workers according to the number of panels they install or finish per day; others pay an hourly rate. A 40-hour week is standard, but sometimes the workweek may be longer. Those who are paid hourly rates receive premium pay for overtime.

Some installers and lathers are members of the United Brotherhood of Carpenters and Joiners of America, and some finishers are members of the International Brotherhood of Painters and Allied Trades.

Related Occupations

Drywall workers and lathers combine strength and dexterity with precision and accuracy to make materials fit according to a plan. Other occupations that require similar abilities include insulation workers, floor covering installers, plasterers, and form builders.

Sources of Additional Information

For information about work opportunities in drywall application and finishing, contact local drywall installation contractors; a local of the unions previously mentioned; a local joint union-management apprenticeship committee; a State or local chapter of the Associated Builders and Contractors; or the nearest office of the State employment service or State apprenticeship agency.

For details about job qualifications and training programs in drywall application and finishing, write to:

Associated Builders and Contractors, Inc., 729 15th St. NW., Washington, D.C. 20005.

International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, D.C. 20006.

National Joint Painting, Decorating, and Drywall Apprenticeship and Training Committee, 1750 New York Ave. NW., Washington, D.C. 20006.

For information on training programs in lathing, write to:

United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, D.C. 20001.

Electricians

(D.O.T. 729.381-018; 822.361-018, -022; 824.261, .281-010, -018, .381, .681; 825.381 -030, -034, 829.281-014 and 952.364 and .381)

Nature of the Work

Heating, lighting, power, air-conditioning, and refrigeration components all operate through electrical systems that are assembled, installed, and maintained by electricians. Electricians generally specialize in either construction or maintenance, although some workers do both.

To install the electrical systems in factories, homes, and other structures, electricians follow blueprints as well as instructions from supervisors. To install wiring in factories and offices, they first place conduit (pipe or tubing) inside partitions, walls, or other concealed areas as designated by building plans. Workers also fasten to the wall small metal and plastic boxes that will house electrical switches and outlets. To complete circuits between these boxes, they then pull insulated wires or cables through the conduit. They work carefully to avoid damaging any wires or cables. In lighter construction, such as housing, plastic-covered wire usually is used rather than conduit.

Regardless of the type of wire being used, electricians connect it to circuit breakers, transformers, or other components. Wires are joined by twisting ends together with pliers and covering the ends with special plastic connectors. When additional strength is desired, they may use an electric "soldering gun" to melt metal onto the twisted wires, then cover them with durable, electrical tape. When the wiring is finished, they test the circuits for proper connections.

In addition to wiring a building's electrical system, electricians may install coaxial or fiber optic cable for computers and telecommunications equipment. As part of the deregulation of the telephone industry, individuals and businesses can now install and maintain the phone lines in their own buildings. As a result, some electricians install telephone wiring and equipment.

Maintenance work varies greatly, depending on where the electrician is employed. Electricians who work in large factories may repair particular items, such as motors or electronic controllers for machine tools and robots. Those in office buildings and small plants can repair all kinds of electrical equipment. Electricians spend much of their time doing preventive maintenance—periodic inspection of equipment to locate and correct defects before breakdowns occur. When trouble occurs, they must find the cause and make repairs. Electricians may replace items such as circuit breakers, fuses, switches, or wire. When working with complex electronic devices, they may work with engineering technicians or engineers. They also may advise management whether continued operation of equipment would be hazardous, and they may install new electrical equipment.

Electricians use handtools such as screwdrivers, pliers, knives, and hacksaws. They also use power tools, testing equipment, and oscilloscopes.

Working Conditions

Electricians' work is active and sometime strenuous. They often work from ladders and scaffolds. They frequently work in awkward or cramped positions. Electricians risk injury from electrical shock, falls, and cuts from sharp objects. To avoid injuries, they use protective equipment and clothing and follow safety procedures.

Employment

Electricians held about 545,000 jobs in 1984. About half were in the construc-

Electricians need good color vision because wires are usually identified by color.

tion industry. Maintenance jobs for electricians are concentrated in manufacturing industries such as automobile, ship, machinery, chemical, and iron and steel production. Public utilities, mines, railroads, and governments also employ some electricians. About 1 out of 8 electricians is self-employed. Like the general population, electricians are concentrated in industrialized and urban areas.

Training, Other Qualifications, and Advancement

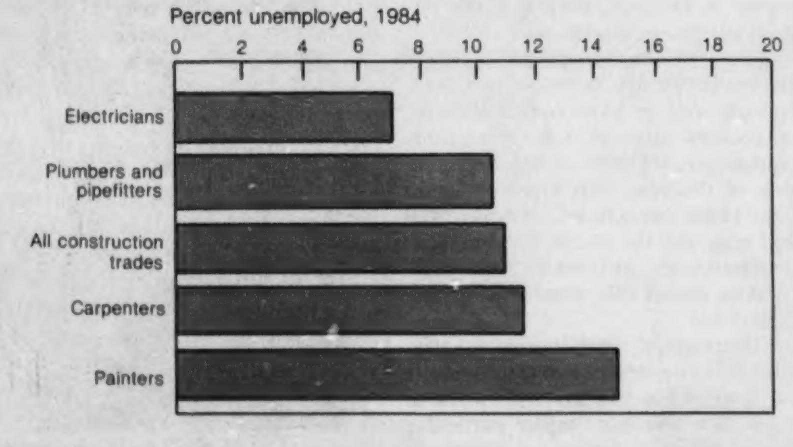
Most training authorities recommend the completion of a 4-year apprenticeship program as the best way to learn the electrical trade because apprenticeship gives trainees a thorough knowledge of the trade and improves their ability to find jobs during their worklife. A larger proportion of electricians are trained through apprenticeship than workers in other construction trades. Nevertheless, many electricians learn their trade informally on the job.

Apprenticeship programs are sponsored and supervised by local union-management committees or by company management committees. Because the training is comprehensive, people who complete apprenticeship programs qualify to do both maintenance and construction work. These programs provide 144 hours of classroom instruction each year in addition to 2,000 hours of on-the-job training. In the classroom, apprentices learn blueprint reading, electrical theory, electronics, mathematics, electrical code requirements, and safety and first aid practices. On the job, under the supervision of experienced electricians, apprentices must demonstrate mastery of the electrician's work. At first, apprentices drill holes, set anchors, and set up conduit. Later, they measure, bend, and install conduit, as well as install, connect, and test wiring, outlets, and switches. They also learn to set up and draw diagrams for entire electrical systems.

Beginners who are not apprentices can pick up the trade informally by working as helpers for experienced electricians. While learning to install conduit, connect wires, and test circuits, helpers are also taught safety practices. Many helpers gain additional knowledge through trade school or correspondence courses, or through special training in the Armed Forces.

All applicants should be in good health and have at least average physical strength. Agility and dexterity also are important. Good color vision is needed because workers frequently must identify electrical wires by color. Applicants for apprentice positions usually must be at least 18 years old and have a high school or vocational school diploma. Courses in electricity, electronics, mechanical drawing, science, algebra, and shop provide a good background. A background in electronics is increasingly important for people wishing to become maintenance electricians because of the increasing use of complex electronic controls on manufacturing equipment.

The unemployment rate for electricians generally is lower than the rates for other construction workers.



SOURCE: Bureau of Labor Statistics

To obtain a license, necessary for employment in most localities, electricians must pass an examination that tests their knowledge of electrical theory, the National Electric Code, and local electric and building codes.

Experienced electricians can become supervisors. Electricians with sufficient capital and management skill can start their own contracting businesses. In many areas, a contractor must have an electrical contractor's license.

Job Outlook

Employment of electricians is expected to increase about as fast as the average for all occupations through the mid-1990's. As the population and the economy grow, more electricians will be needed to maintain the electrical systems used by industry and to install electrical devices and wiring in new homes, factories, offices, and other structures. In addition to traditional wiring, electricians will install wiring and fiber optic cable for computers and telecommunications equipment. Increasingly, buildings are being prewired for such equipment during their construction. Because the use of such equipment is expected to increase sharply, this type of installation may create many jobs for electricians.

In addition to jobs created by increased demand for electricians, many openings will occur as electricians transfer to other occupations or leave the labor force. The total number of job openings for electricians each year is among the highest for all craft occupations, mainly because the occupation is large. A smaller proportion of electricians than of other craft workers leave their occupation each year. Electricians have a strong attachment to their occupation because they must spend about 4 years acquiring their training and enjoy relatively high earnings.

Although the employment outlook for electricians is expected to be good over the long run, people wishing to become construction electricians should expect to experience periods of unemployment. These result from the limited duration of construction projects and the cyclical nature of the construction industry. During economic downturns, job openings for electricians are reduced as the level of construction declines. Although employment of maintenance electricians is steadier than that for construction electricians, electricians working in the automobile, steel, and other industries that are sensitive to cyclical swings in the economy may be laid off during recessions.

Job opportunities for electricians also vary by geographic area. Employment opportunities follow the movement of people and businesses among States and local areas and reflect differences in local economic conditions. The number of job opportunities in a given year may fluctuate widely from area to area.

Earnings

Median weekly earnings for full-time electricians who were not self-employed were $440 in 1984. The middle 50 percent earned between $325 and $595 weekly. The lowest 10 percent earned less than $240, while the highest 10 percent earned more than $725.

Electricians in metropolitan areas earned about $13.00 an hour in 1984 compared with $8.33 an hour for all production and nonsupervisory workers in private industry, except farming. They generally earn more in the Midwest and West than in the Northeast and South. Because the seasonal nature of construction affects electricians less than workers in most building trades, annual earnings also tend to be higher.

Apprentice wage rates start at from 40 to 50 percent of the rate paid to experienced electricians and increase periodically.

Many construction electricians are members of the International Brotherhood of Electrical Workers.

Among unions organizing maintenance electricians are the International Brotherhood of Electrical Workers; the International Union of Electrical, Radio and Machine Workers; the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; and the United Steelworkers of America.

Related Occupations

To install and maintain electrical systems, electricians combine manual skill and a knowledge of electrical materials and concepts. Other occupations involving similar skills include air-conditioning mechanics, cable installers and repairers, electronics mechanics, and elevator constructors.

Sources of Additional Information

For details about apprenticeships or other work opportunities in this trade, contact local electrical contractors; local chapters of the Independent Electrical Contractors, Inc., the National Electrical Contractors Association, or the Associated Builders and Contractors; a local union of the International Brotherhood of Electrical Workers; a local union-management apprenticeship committee; local firms that employ maintenance electricians; or the nearest office of the State employment service or State apprenticeship agency. Some local employment service offices screen applicants and give aptitude tests.

For general information about the work of electricians, contact:

Independent Electrical Contractors, Inc., 1101 Connecticut Ave. NW., Suite 700, Washington, D.C. 20036.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

National Electrical Contractors Association, 7315 Wisconsin Ave., Bethesda, Md. 20814.

National Joint Apprenticeship and Training Committee for the Electrical Industry, 9700-E George Palmer Hwy., Lanham, Md. 20706.

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

Glaziers

(D.O.T. 865.361 and .381)

Nature of the Work

Glass serves many uses in modern buildings. Insulated glass keeps in warmed or cooled air; tempered and wire glass makes doors and windows more secure; and large glass panels give skyscrapers a distinctive look while reducing the need for artificial lighting. Glaziers select, cut, install, and remove all types of glass as well as plastics and similar materials used in place of glass. Some glaziers replace broken glass in automobiles and may also install mirrors, tempered glass doors, the metal hardware used in setting glass, and automatic doors.

For most jobs, the glass is precut and mounted in metal frames at a factory. It arrives at the job site ready to be positioned and secured in place by glaziers. Glaziers may use a crane or hoist with suction cups attached to lift a large, heavy piece of glass. In all cases, however, to prevent shattering, glaziers use their hands to guide and position the glass.

For some jobs, glass is cut at a contractor's shop by automated scoring and breaking machines. At the site, glaziers secure glass in place with materials such as mastic—a pastelike cement—bolts, rubber gaskets, putty, metal clips, and metal or wood molding. When using a rubber gasket—a thick, molded rubber half-tube with a split running its length—to secure window glass, they first position the gasket around the window opening, then set the glass into the split side of the gasket, causing it to clamp to the edges and hold the glass firmly in place.

When metal clips and molding are used to secure window glass, glaziers secure the molding to the window opening, place the glass in the molding, and force springlike metal clips between the glass and the molding. The clips exert pressure and keep the glass firmly in place.

When using putty, workers first spread it neatly against and around the edges of the molding on the inside of the window opening. Next, they install the glass. Pressing it against the putty on the inside molding, workers screw or nail outside molding that loosely holds the glass in place. To hold it firmly, they pack the space between the molding and the glass with putty and then trim any excess putty with a putty knife.

For some jobs, the glazier must cut the glass manually. To prepare the glass for cutting, glaziers rest it either on edge on a rack or A-frame or flat against a cutting table. They then measure and mark the glass for the cut.

Glass is cut with a special tool that has a very hard metal wheel about 1/6 inch in diameter. Using a straightedge as a guide, the glazier presses the cutter's wheel firmly on the glass, guiding and rolling it carefully to make a score just below the surface. To help the cutting tool move smoothly across the glass, workers brush a thin layer of oil along the line of the intended cut or dip the cutting tool in oil. Immediately after cutting, the glazier presses on the shorter end of the glass to break it cleanly along the cut.

In addition to handtools such as glasscutters and putty knives, glaziers use power tools such as hoists, saws, drills, cutters, and grinders.

Glaziers often work in pairs, frequently at great heights.

Working Conditions

Glaziers often work outdoors—sometimes in uncomfortable weather. Occasionally they must work on scaffolds at great heights, but not when weather conditions pose a safety problem. In addition, the job requires a considerable amount of bending, stooping, lifting, and standing. Glaziers may be injured by broken glass or cutting tools, falls from scaffolds, or from lifting glass.

Glaziers may have to travel to job sites in areas where few people, if any, are equipped and qualified to install glass in commercial buildings such as stores.

Employment

About 37,000 glaziers held jobs in 1984. Most worked for glazing contractors engaged in new construction, alteration, and repair or for wholesale distributors and glass and hardware stores that install or replace glass. Others worked for government agencies or businesses that do their own construction. Glaziers work throughout the country, but jobs are concentrated in metropolitan areas. Many glaziers work in western regions of the country, where warm weather fosters the use of glass in construction.

Training, Other Qualifications, and Advancement

Training authorities recommend that glaziers learn the trade through an apprenticeship program that lasts 3 to 4 years. However, many glaziers learn the trade informally on the job by assisting experienced workers.

Learning the trade through informal on-the-job training usually starts by carrying glass and cleaning up debris in glass shops. Eventually, helpers assist experienced glaziers on a simple installation job. This learning process may not provide training as complete as an apprenticeship program, however, and may take longer.

Apprenticeship programs, which are administered by local union-management committees or local contractors' associations, consist of on-the-job training as well as 144 hours of classroom instruction and/or home study each year.

On the job, apprentices learn to use the tools and equipment of the trade; handle, measure, cut, and install glass and metal framing; cut and fit moldings; and install and balance glass doors. In the classroom, they are taught basic mathematics, blueprint reading and sketching, general construction techniques, safety practices, and first aid.

Local apprenticeship administrators determine how apprentices are recruited and selected. Applicants for apprenticeships generally must be in good physical condition and at least 17 years old. In some areas, applicants must take mechanical aptitude tests. Persons applying for helper positions will find that employers prefer high school or vocational school graduates. Courses in general mathematics, blueprint reading or mechanical drawing, general construction, and shop provide a helpful background.

For most glaziers, advancement consists of increases in pay; some may advance to supervisory jobs. Some glaziers become contractors; however, the contracting business is very competitive and managerial skill is needed to operate successfully.

Job Outlook

Employment of glaziers is expected to increase faster than the average for all occupations through the mid-1990's. Besides jobs created by increased demand for glaziers, openings will arise as experienced glaziers transfer to other occupations or leave the labor force. However, because this occupation is fairly small, only a limited number of openings will become available. Employment opportunities should be greatest in metropolitan areas, where most glazing contractors and retailers are located.

Over the long run, population and business growth will create a rising demand for new residential and commercial buildings, such as apartments, offices, and stores. Since glass will continue to be popular in building design, the demand for glaziers to install and replace glass window units also will grow. Even though employment prospects will generally be good, glaziers may experience periods of unemployment between construction projects and during downturns in construction activity.

People wishing to enter glazing apprenticeships may face competition for positions because high wages and all-round training attract many people to these programs.

Earnings

In 1984, glaziers earned about $330 a week. The middle 50 percent earned between $265 and $465. The bottom 10 percent earned less than $220; the top 10 percent earned more than $650 a week. Glaziers in construction, who are heavily unionized, generally earn considerably more than glaziers in retail and wholesale trade. Apprentice wage rates usually start at 50 percent of the rate paid to experienced glaziers and increase every 6 months. During the final year of their training, apprentices receive 90 percent of the rate for experienced workers. Yearly earnings of glaziers and apprentices, however, generally are slightly lower than hourly rates would indicate because the annual number of hours they work can be adversely affected by poor weather and fluctuations in construction activity. Glaziers also may receive health insurance, pensions, paid vacation, and holidays.

Many glaziers employed in construction are members of the International Brotherhood of Painters and Allied Trades.

Related Occupations

Glaziers use their knowledge of construction materials and techniques to install glass. Other construction workers whose jobs also involve skilled, custom work are bricklayers, drywall applicators, floor layers, painters, paperhangers, stucco masons, terrazzo workers, and tilesetters.

Sources of Additional Information

For more information about glazier apprenticeships or work opportunities, contact local glazing or general contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship agency; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of glaziers, contact:

International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, D.C. 20006.

For information concerning training for retail and wholesale glaziers, contact:

Membership Services, National Glass Association, 8200 Greensboro Dr., McLean, Va. 22102.

Insulation Workers

(D.O.T. 863.364-010 and -014, .381-010 and -014, and .664-010)

Nature of the Work

Properly insulated homes and buildings reduce energy consumption by preventing loss of cool air on warm days and hot air on cold days. Meat storage rooms, steam pipes, and boilers are other examples where the wasteful transfer of heat to or from the space inside can be minimized by insulation. Installing insulating material is the responsibility of insulation workers.

Insulation workers may paste, staple, wire, tape, or spray insulation to an appropriate surface. When covering a steam pipe, for example, insulation workers measure and cut a tube of insulation to the necessary length, stretch it open along a cut that runs the length of the tube, and slip it over the pipe. To secure the insulation, they wrap and fasten wire bands around it, tape it, or wrap a cover of tar paper, cloth, or canvas over it and sew or staple the cover in place. Sometimes insulation workers weld sheet metal around insulated pipes to waterproof the insulation.

When covering a wall or other flat surface, workers may use a hose to spray foam insulation onto a wire mesh. The wire mesh provides a rough surface to which the foam can cling and adds strength to the finished surface. Workers may apply a final coat for a finished appearance.

In attics or exterior walls, which do not require either wire mesh for adhesion or a final coat for appearance, workers often use a compressor to blow in loose-fill insulation. This is the fastest and most popular insulation method, especially in uninsulated older homes. A tender feeds the machine with shredded fiberglass insulation or rock wool, and the compressor forces this insulation through a hose. Another worker sprays the insulation from the compressor hose into the attic or between the interior and exterior walls.

In another method, insulation workers staple fiberglass batts in exterior walls and ceilings before drywall, paneling, or plaster walls are put in place. This technique is used in new construction or major renovations.

Insulation workers use common handtools—trowels, brushes, knives, scissors, sewing equipment, and stapling guns. They use powersaws to cut insulating materials, welding machines to join sheet metal or secure clamps, and compressors for blowing or for spraying insulation.

Working Conditions

Insulation workers generally work indoors. They spend most of the workday on their feet, either standing, bending, or squatting. Sometimes they work from ladders or in tight spaces. However, the work is not strenuous; it requires more coordination than strength. Insulation work is often dusty and dirty. The minute particles from insulation material can irritate the eyes, skin, and respiratory system. Removing cancer-causing asbestos insulation—at one time the most common form of insulation but rarely used today—is a hazardous task. To protect themselves from the dangers of asbestos and irritants, workers wear protective masks and clothing and keep work areas ventilated.

Employment

Insulation workers held about 52,000 jobs in 1984; most worked for insulation or other construction contractors. Others worked in shipbuilding and in other manufacturing industries, such as chemicals and petroleum re-

Insulation increases energy efficiency and often reduces unwelcome noise.

fining, that have extensive installations for power, heating, and cooling. Most worked in urban areas. In other areas, work may be done by carpenters, heating and air-conditioning installers, or drywall installers.

Training, Other Qualifications, and Advancement

Most insulation workers learn their trade through on-the-job training programs. Trainees are assigned to experienced insulation workers for instruction and supervision. They begin with simple tasks, such as supplying insulation to experienced workers, or holding material while it is fastened in place. On-the-job training can take up to 2 years, depending on the work. Learning to install insulation in homes generally requires less training than insulation application in commercial and industrial settings. When they gain experience, trainees receive less supervision, more responsibility, and higher pay.

In contrast, trainees in apprenticeship programs receive in-depth instruction in all phases of insulation. Apprenticeship programs are provided by a joint committee of local insulation contractors and the local union of the International Association of Heat and Frost Insulators and Asbestos Workers. Programs consist of 4 years of on-the-job training coupled with classroom instruction, and trainees must pass practical and written tests to demonstrate a knowledge of the trade.

For entry jobs, insulation contractors prefer high school graduates who are in good physical condition and licensed to drive. High school courses in blueprint reading, shop math, sheetmetal layout, and general construction provide a helpful background. Applicants seeking apprenticeship positions must have a high school diploma or its equivalent, and be at least 18 years old.

Skilled insulation workers may advance to supervisor, shop superintendent, or insulation contract estimator. Many insulation workers are members of the International Association of Heat and Frost Insulators and Asbestos Workers.

Job Outlook

Employment of insulation workers is expected to grow as fast as the average for all occupations through the mid-1990's. As the construction industry grows, the need to insulate boilers and pipes in new factories and powerplants will stimulate employment growth. Moreover, existing buildings that need extra insulation to save fuel and the need to remove and replace asbestos insulation will add to employment requirements. In addition to jobs created by increased demand for insulation work, openings will arise as workers transfer to other occupations, retire, or die.

Insulation workers in the construction industry may experience periods of unemployment between jobs and during downturns in construction activity. Workers employed in industrial plants generally have more stable employment because maintenance and repair must be done on a continuing basis.

Unlike other construction occupations, insulation workers usually do not lose worktime when weather conditions are poor. Most insulation is applied after buildings are enclosed.

Earnings

Median weekly earnings for insulation workers working full time were about $350 in 1984. The middle 50 percent earned between $250 and $550 a week. Insulation workers doing commercial and industrial work earn substantially more than those working in residential construction, which does not require as much skill.

Apprentice wage rates start at about half the rate paid to experienced workers and increase periodically.

Related Occupations

Insulation workers combine a knowledge of insulation materials with their skills of cutting, fitting, and installing materials. Workers in occupations involving similar skills include carpenters, carpet layers, drywall applicators, floor layers, roofers, and sheetmetal workers.

Sources of Additional Information

For information about training programs or other work opportunities in this trade, contact a local insulation contractor; a local of the International Association of Heat and Frost Insulators and Asbestos Workers; the nearest office of the State employment service or State apprenticeship agency, or:

National Insulation Contractors Association, 1025 Vermont Ave. NW., Suite 410, Washington, D.C. 20005.

Painters and Paperhangers

(D.O.T. 840.381, .681, and .684; 841.381; and 845.681)

Nature of the Work

Paint and wall coverings make rooms more attractive and comfortable. In addition, paints and similar materials protect outside walls from wear caused by the weather. Although some people do both types of work, painting and paperhanging require different skills.

Painters apply paint, varnish, and other finishes to buildings and other structures. They choose the right paint or finish for the surface to be covered, taking into account durability, ease of handling, method of application, and customers' wishes. They prepare the surface to be covered so that the new paint will adhere properly. Sometimes it is necessary to remove the old coating before the new paint or coating is applied. Painters use several methods to remove old coatings, including stripping with solvents, sanding, wire brushing, and water and sand blasting. Painters also wash walls and trim to remove dirt and grease, fill nail holes and cracks, sandpaper rough spots, and brush off dust. When painting new surfaces, they cover them with a primer or sealer to make a suitable surface for the finish coat. Painters mix paints and match colors, relying on knowledge of paint composition and color harmony.

Painters use brushes, rollers, and spray guns to apply paint thoroughly, uniformly, and rapidly to surfaces such as wood, concrete, metal, masonry, plastic, or drywall. Brushes of many sizes and shapes are used on a wide variety of surfaces. Rollers and spray guns are used on surfaces such as walls and ceilings, where they permit faster painting than brushes. Spray guns also are used on surfaces that are difficult to paint with a brush, such as cinder block and metal fencing.

When working on tall buildings and similar structures, painters erect scaffolding, including "swing stages" (scaffolds suspended by ropes or cables attached to roof hooks). When painting steeples and similar conical structures, they use a "bosun chair" (a device somewhat like a swing).

Paperhangers cover walls and ceilings of rooms with decorative wall coverings made of fabric, vinyl, paper, or other materials. The first step in hanging wall coverings, as in painting, is to prepare the surface to be covered. To do this, paperhangers apply "sizing," a material that seals the surface and enables the covering to stick better. In redecorating, they may have to remove the old covering by wetting it with water-soaked sponges or by applying mild solvents. If there are many layers, they may use steam to remove them. Frequently, it is necessary for paperhangers to patch holes before hanging the new wall covering.

When the surface is prepared, paperhangers measure the area to be covered and cut the covering into strips of the proper size. While cutting the strips, paperhangers check the covering for flaws and closely examine the pattern so it can be matched when the strips are hung.

Paperhangers prepare paste or other adhesives according to manufacturers' directions, and brush or roll the adhesive on the covering. When they place the cut strips on the wall or ceiling, paperhangers must make sure they are hung straight with the edges carefully butted together to make tight, closed seams. Using broad knives and brushes, paperhangers smooth the strips to make them stick and to remove air bubbles and wrinkles. They trim the excess covering from the top and bottom of each strip with a razor knife.

Working Conditions

Painters and paperhangers must stand for long periods. Their jobs also require a considerable amount of climbing and bending. These workers must have strong arms because much of the work is done with arms raised overhead. Painters and paperhangers risk injury from slips or falls off ladders and scaffolds. Painters often work outdoors. Many painters form their own businesses and become successful painting contractors; however, in doing so, they may have to spend many additional hours seeking new customers, recruiting and training employees, and dealing with paperwork.

Employment

Painters and paperhangers held about 378,000 jobs in 1984; most were held by painters. Many painters and paperhangers work for contractors engaged in new construction, repair, restoration, or remodeling work. In addition, organizations that own or manage large buildings, such as hotels, offices, and apartment complexes, employ maintenance painters, as do some schools, hospitals, and factories.

A significant number of workers in these trades are in business for themselves. About 2 of every 5 painters and paperhangers are self-employed, compared to one-fourth of all building trades workers. In addition, many painters hold part-time jobs.

Training, Other Qualifications, and Advancement

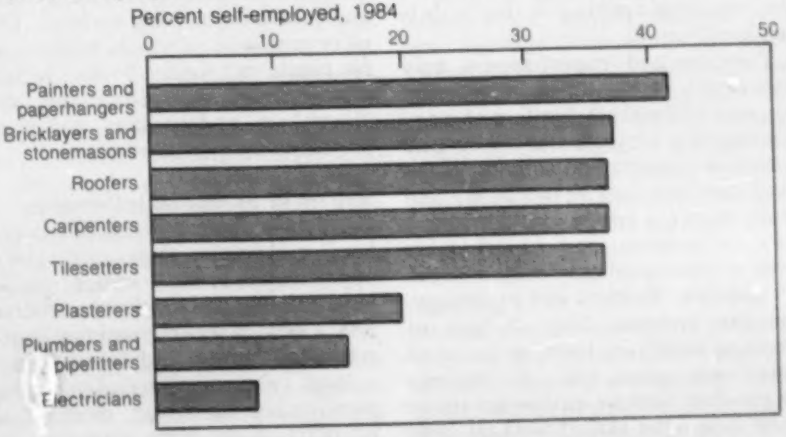
Painting and paperhanging are learned through apprenticeship or informal, on-the-job instruction. Most training authorities recommend completion of an apprenticeship as the best way to become a painter or paperhanger, although some new workers begin as helpers to experienced painters. Few opportunities for informal training exist for paperhanger trainees because there are relatively few paperhangers, and most work alone.

The apprenticeship for painters and paperhangers consists of 3 years of on-the-job training, in addition to 144 hours of related classroom instruction each year. Apprentices receive instruction in subjects such as color harmony, use of tools, surface preparation, application of coating, paint mixing and matching, care of tools and equipment, staining, glazing, gold leafing, blueprint reading, use of ladders and scaffolding, wood finishing, and safety. They also learn the different skills required for painting and paperhanging as well as the general nature of the work in the other building trades.

On-the-job instruction covers similar skills for apprentices and helpers. Under the direction of experienced workers, trainees carry supplies, erect scaffolds, and do other simple tasks while they learn about the different kinds of paint and painting equipment. Within 2 or 3 years, trainees learn to prepare surfaces for painting and paperhanging, to mix paints, and to apply paint and wall coverings effi-

Many painters hold part-time jobs.

Painters and paperhangers have the highest proportions of self-employed of all construction craft occupations.



SOURCE: Bureau of Labor Statistics

ciently. Near the end of their training, they may learn decorating concepts, color coordination, and cost-estimating techniques.

Applicants for apprentice or helper jobs generally must be at least 16 years old and in good physical condition. A high school or vocational school education that includes courses in mathematics is generally required by employers and local apprenticeship committees. Applicants should have manual dexterity and a good color sense.

Painters and paperhangers may advance to supervisory jobs with painting and decorating contractors. A sizable number establish their own painting and decorating businesses.

Job Outlook

Employment of painters and paperhangers is expected to grow more slowly than the average for all occupations through the mid-1990's. Although business growth will create a demand for new buildings and industrial structures, requiring more painters and paperhangers, employment growth may slow as more homeowners paint or paper their own houses and as more building exteriors are made of nonpaintable surfaces.

Replacement needs will account for most of the job openings for painters and paperhangers. Each year thousands of jobs will become available as painters transfer to other occupations or leave the labor force. Since there are no strict training requirements for entry, many people with limited skills work as painters for a short time and then move on to other types of work, thus creating many job openings. Because there are fewer paperhangers, the number of openings in that trade is relatively small.

Painters and paperhangers may experience periods of unemployment because of the short duration of many construction projects and the cyclical nature of construction activity. However, remodeling, restoration, and maintenance projects provide many jobs for painters and paperhangers even when overall construction activity declines. Painters and paperhangers can improve their chances of avoiding layoffs by learning to use as many tools, paints, and wall coverings as possible because employers try to keep their most skilled workers even during business slumps.

People wishing to enter painting and paperhanging apprenticeships may face competition for positions. High wages and good training offered by these programs attract many people. Most painters and paperhangers work for contractors, painting the surfaces of residential and commercial construction projects for hourly wages.

Earnings

Median weekly earnings for painters who were not self-employed were about $310 in 1984. Most earned between $221 and $429 weekly. The top 10 percent earned over $538, and the bottom 10 percent earned less than $172 a week. In general, paperhangers earn more than painters.

The hourly rate for painters who do primarily maintenance tasks was about $11.65 in 1984. In comparison, the average rate for all nonsupervisory or production workers in private industry, except farming, was $8.33 an hour. Annual income for painters and paperhangers may not be as high as hourly rates would indicate because some worktime is lost due to bad weather and occasional unemployment.

Hourly wage rates for apprentices usually start at 40 to 50 percent of the rate paid to experienced workers and increase every 6 months until the full rate of pay is reached at the completion of apprenticeship.

A large proportion of painters and paperhangers are members of the International Brotherhood of Painters and Allied Trades. A few are members of other unions.

Related Occupations

Painters use paints, varnishes, and lacquers to decorate and protect wood, metal, and other surfaces. Other occupations in which workers apply paints and similar finishes include spray painters, shipyard painters, metal sprayers, undercoaters, and transportation equipment painters.

Sources of Additional Information

For details about painting and paperhanging apprenticeships or other work opportunities in these trades, contact local painting and decorating contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship committee; or the nearest office of the State apprenticeship agency or State employment service. To find out who administers the apprenticeship program in your area, contact:

International Brotherhood of Painters and Allied Trades, 1750 New York Ave. NW., Washington, D.C. 20006.

Painting and Decorating Contractors of America, 7223 Lee Hwy., Falls Church, Va. 22046.

For general information about the work of painters and paperhangers, contact:

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

Plasterers

(D.O.T. 842.361-018, -022, and -026, and .381-014)

Nature of the Work

Plasterers finish interior walls and ceilings with plaster materials that form fire-resistant and relatively soundproof surfaces, and they apply durable cement plasters, epoxy finishes, and stucco to exterior surfaces. They also cast ornamental designs in plaster.

To interior surfaces such as cinder block and gypsum lath, plasterers apply two coats of plaster. The first or brown coat is a brown mixture that provides a base; the second or finish coat (also called white coat) is a lime-based plaster. When on metal lath (supportive wire mesh) foundations, plasterers first apply a preparatory or scratch coat, using either spray or a trowel (a flat, 4-inch by 10-inch metal plate with a handle), in wavelike motions to spread a rich plaster mixture into and over the metal lath. Before the plaster sets, workers scratch its surface with a tool similar to a rake, producing ridges so the brown coat will cling tightly.

For the brown coat—whether applied to a scratch coat, cinder block, or gypsum lath—laborers prepare a thick but smooth plaster. Plasterers spray or trowel this mixture onto the surface, and smooth the plaster to an even, level surface for finishing.

For the finish coat, plasterers prepare a mixture of lime, plaster of Paris, and water. They quickly apply it onto the brown coat using a hawk (a light, metal plate with handle), trowel, brush, and water. This mixture, which sets very quickly, produces a very smooth, durable finish.

Plasterers also work with a plaster material that can be finished in a single coat. Thin-coat or veneer plaster, made of lime and plaster of paris and mixed with water on the job site, can be applied on interior masonry surfaces, specially manufactured wallboard, or drywall prepared with a bonding agent. Thin-coat plaster, applied like white coat, also provides a smooth, durable finish.

Plasterers create decorative surfaces as well. For example, while the final coat is still soft, they press a brush or trowel firmly against the surface and use a circular hand motion to create decorative swirls.

For exterior work, plasterers usually apply a mixture of white cement and sand—stucco—over cement, concrete, and masonry. Sometimes stucco is applied directly to a wire lath scratch coat. As an alternative, they embed marble or gravel chips into the finish coat to achieve a uniform, pebblelike, decorative finish.

Some plasterers apply insulation systems to the exteriors of new and old buildings. They cover the outer wall with insulation board and fiberglass cloth and then trowel on a scratch coat. They then apply an additional coat of plaster material, often with a decorative finish.

Plasterers sometimes do complex decorative and ornamental work that requires much more skill than other plastering and provides an opportunity for an individual to be creative. For example, they may mold intricate designs for the walls and ceilings of public buildings. To make these designs from an architect's blueprint, plasterers pour a special plaster into a mold and allow it to set. Workers then remove the molded plaster and cement it to the desired surface.

Working Conditions

Plasterers work outside when applying stucco but most jobs are indoors. Sometimes plasterers work on scaffolds high above the ground to finish walls and ceilings.

Plastering is physically demanding—requiring considerable standing, bending, lifting, and reaching overhead. The work can be dusty and dirty; plaster materials also soil shoes and clothing and can irritate skin and eyes.

Employment

Plasterers held about 21,000 jobs in 1984. Most plasterers work on new construction and alteration jobs, particularly where special architectural and lighting effects are part of the work. Some repair and renovate older buildings. Many plasterers are employed in Florida, California, and the Southwest, where stucco work is very popular.

Most plasterers work for independent contractors. About 1 out of every 3 plasterers is self-employed.

Training, Other Qualifications, and Advancement

Most training authorities recommend an apprenticeship as the best way to learn plastering. However, most people learn the trade by working as helpers, observing and learning from experienced plasterers.

Apprenticeship programs, sponsored by local joint committees of contractors and unions, generally consist of at least 2 years of on-the-job training, in addition to at least 144 hours annually of classroom instruction in drafting, blueprint reading, and mathematics for layout work.

In class, apprentices start with a history of the trade and the industry. They also learn about the uses of plaster, costs, and many other subjects. On the job, they learn about lath bases, plaster mixes, methods of plastering, blueprint reading, and safety from experienced plasterers. Some apprenticeship programs allow individuals to obtain training in related occupations such as cement masonry and bricklaying.

Those who learn the trade informally as helpers usually start by carrying materials, setting up scaffolds, and mixing plaster. Then they learn to apply the scratch and brown coats and the finish coat.

Applicants for apprentice or helper jobs generally must be at least 17 years old, be in good physical condition, and have manual dexterity. Applicants who have a high school education are preferred. Courses in general mathematics, mechanical drawing, and shop provide a useful background.

Plasterers may advance to supervisors, superintendents, or estimators for plastering contractors, or may become self-employed, contracting plastering jobs.

Job Outlook

Little or no change in the employment of plasterers is expected through the mid-1990's. Most job openings will result from the need to replace workers who transfer to other occupations or leave the labor force. Throughout much of the 1960's and early 1970's, employment of plasterers declined as more builders switched to drywall construction. This decline has halted in recent years, however, and employment of plasterers may rebound somewhat as a result of increased emphasis on the durability and hardness that troweled finishes provide. Thin-coat plastering, in particular, may gain greater acceptance as more builders and developers recognize its ease of application, durability, and quality of finish. In addition, plasterers will be needed to renovate plaster work in older structures and create special architectural effects such as curved surfaces, which are not practical with drywall materials.

Plasterer applies plaster over scratch coat.

Because most plasterers work in construction, employment prospects may fluctuate from year to year due to changing economic conditions. Bad weather affects plastering less than other construction trades because much of this work is indoors. On exterior surfacing jobs, however, plasterers may lose time because some materials cannot be applied under wet or freezing conditions.

Earnings

Median weekly earnings for plasterers who worked full time were about $350 in 1984. Apprentice wage rates start at about half the rate paid to experienced plasterers and increase 10 percent every 6 months. However, annual earnings for plasterers and apprentices are generally lower than weekly earnings would indicate because poor weather and periodic declines in construction activity limit their work time.

A large proportion of plasterers are members of unions. They are represented by either the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or the International Union of Bricklayers and Allied Craftsmen.

Related Occupations

Other construction workers who use a trowel as the primary tool include concrete masons, bricklayers, stonemasons, and tilesetters.

Sources of Additional Information

For information about apprenticeships or other work opportunities, contact local plastering contractors; locals of the unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of plasterers, contact:

International Union of Bricklayers and Allied Craftsmen, 815 15th St. NW., Washington, D.C. 20005.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

Plumbers and Pipefitters

(D.O.T. 862.261, .281-010 and -014, .361-014, -018, and -022, and .381 except -010 and -038, .681, .682-010, and .684-034)

Nature of the Work

By simply turning on a faucet, a person activates a long, complex system of pipes. Small copper or plastic pipes connect the faucet to the building's main water pipes. These pipes in turn are connected to the cast iron or concrete pipes of the municipal water system that run underground for miles to a water treatment plant. Larger pipes connect the plant to a river, reservoir, or other water source.

Other pipe systems dispose of waste, provide water to fight fires, and transport water and steam for cooling and heating. Pipe systems in powerplants play an essential role in producing electricity by carrying the steam that powers huge turbines. Pipes also are used in manufacturing plants to move material through the production process.

Plumbers and pipefitters install and maintain all these vitally important pipe systems. Although plumbing and pipefitting are sometimes considered a single trade, workers may specialize in either craft. Plumbers build and repair the water, waste disposal, drainage, and gas systems in homes and commercial and industrial buildings. They also install plumbing fixtures—bathtubs, sinks, and toilets—and appliances such as dishwashers and water heaters. Pipefitters build and repair both high- and low-pressure pipe used in heating, ventilating, and air-conditioning of buildings, manufacturing, generation of electricity, and transportation. They may specialize further, according to the type of pipe system with which they work. Steamfitters, for example, install pipe systems that move liquids or gases under high pressure. Sprinklerfitters install automatic fire control sprinkler systems in buildings.

Because the purpose, size, and operation of pipe systems differ, the materials and construction techniques used by plumbers and pipefitters vary by construction project. Water systems in homes, for example, use copper, plastic, and galvanized steel pipe that can be handled and installed by one or two workers. Municipal sewage systems, on the other hand, are made of large clay pipe. Installation normally requires crews of pipefitters. Despite these differences, all plumbers and pipefitters must be able to follow building plans and instructions from supervisors, lay out the job, and work efficiently with the materials and tools of the trade. The following illustrates how plumbers use these skills to install piping in a house.

Working from blueprints or shop drawings that show the planned location of pipes, plumbing fixtures, and appliances, plumbers lay out the job to fit the piping into the structure of the house with the least waste of material and without damaging the structure. They measure and mark areas where pipe will be installed and connected. They also check for obstructions, such as electrical wiring, and plan how to install pipe around the problem.

To install the piping, plumbers may saw holes in walls, ceilings, and floors. They may hang steel supports from ceilings that will hold the pipe in place. To assemble the system, plumbers cut and bend lengths of pipe using saws, pipe cutters, and pipe-bending machines. They connect lengths of pipe with fittings; the method depends on the type of pipe used. For copper pipe, plumbers slide fittings over the end of the pipe and solder the fitting in place with a torch. For plastic pipe, plumbers simply connect the sections with adhesives.

When the piping is in place, plumbers install the fixtures and appliances and connect the system to the outside water and sewer lines. Using pressure gauges, they check the system to insure that the plumbing works properly.

Working Conditions

Plumbing and pipefitting work is demanding. Workers do a lot of heavy lifting and must stand for long periods. Plumbers and pipefitters work both indoors and outside in all types of weather. They often work in cramped and dirty places. They can be injured by falls from ladders, cuts from sharp tools, and burns from hot pipes or from soldering equipment.

Employment

Plumbers and pipefitters held about 395,000 jobs in 1984. Most work for mechanical and plumbing contractors engaged in new construction or repair, alteration, or modernization work. About 1 out of 6 plumbers and pipefitters is self-employed. Some plumbers install and maintain pipe systems for government agencies and public utilities, and some work on the construction of ships and aircraft. Others do maintenance work in industrial and commercial buildings. Pipefitters, in particular, are employed as maintenance personnel in the petroleum, chemical, and food-processing industries where manufacturing operations require the moving of liquids and gases through pipes.

Jobs for plumbers and pipefitters are distributed across the country in about the same proportion as the general population.

Training, Other Qualifications, and Advancement

Apprenticeship is the best way for plumbers or pipefitters to learn all aspects of these trades. Most people, however, learn plumbing and pipefitting by working for several years as helpers to experienced plumbers and pipefitters.

Apprenticeship programs for plumbers and pipefitters are administered by local union-management committees comprised of members of the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry and the Mechanical Contractors Association of America, Inc., or the National Association of Plumbing-Heating-Cooling Contractors. Apprenticeship programs also are administered by local chapters of the Associated Builders and Contractors and the National Association of Plumbing-Heating-Cooling Contractors. Apprenticeships consist of 4 or 5 years of on-the-job training, in addition to at least 216 hours annually of related classroom instruction. Classroom subjects include drafting and blueprint reading, mathematics, applied physics and chemistry, safety, and local plumbing codes and regulations.

On the job, apprentices first learn basic skills such as identifying grades and types of pipe, the use of the tools of the trade, and the safe unloading of materials. As apprentices gain experience, they learn how to work with various types of pipe and to install different piping systems and plumbing fixtures.

People learning the trade as helpers acquire their skills by observing and assisting experienced plumbers and pipefitters. These workers may not learn to work with as wide a variety of materials and piping systems as apprentices.

Applicants for apprentice or helper jobs generally must be at least 18 years old and in good physical condition. Employers prefer high school graduates. Courses in shop, plumbing, general mathematics, drafting, blueprint reading, and physics are helpful. Applicants may be given tests to determine whether they have the mechanical aptitude required in these trades.

Most communities require plumbers to be licensed. To obtain a license, workers must pass an examination to demonstrate knowledge of the trade and of local plumbing codes.

Some plumbers and pipefitters may become supervisors for mechanical and plumbing contractors. Others go into business for themselves. As they expand their activities, they may employ other workers and become contractors.

Job Outlook

Employment of plumbers and pipefitters is expected to grow as fast as the average for all occupations through the mid-1990's. Over the long run, construction and renovation of powerplants, pipelines, office buildings, factories, and other projects that have large, complex pipe systems are expected to spur the demand for pipefitters. Residential construction also is expected to increase the demand for plumbers.

In addition to jobs created by increased demand for plumbers and pipefitters, many openings will occur each year from the need to replace experienced workers who retire, die, or stop working for other reasons. Relatively few plumbers and pipefitters transfer to other occupations, reflecting their lengthy investment in training. Nevertheless, most job openings will stem from replacement needs.

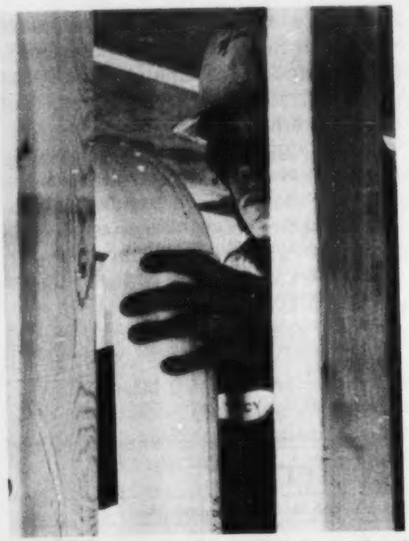
Because of the temporary nature of construction projects, plumbers and pipefitters may become unemployed for short periods when the project on which they are working ends. Some plumbers and pipefitters may face longer periods of unemployment when overall construction activity declines and fewer jobs are available. Employment of these workers, however, generally is less sensitive to changes in economic conditions than many other construction trades. Maintenance of existing piping systems provides jobs for many plumbers and pipefitters even when construction activity declines.

People wishing to enter plumbing and pipefitting apprenticeships are likely to face competition. High wages and opportunities for all-round training attract many people to these programs.

Earnings

Median weekly earnings for plumbers and pipefitters who are not self-employed were $405 in 1984. Most earned between $295 and $585 weekly. The lowest 10 percent earned less than $225; the highest 10 percent earned over $741.

In 1984, hourly wage rates for plumbers and pipefitters in metropolitan areas were about $13.50. In comparison, the average wage for all nonsupervisory and production workers in private industry, except farming, was $8.33. Apprentice wage rates start at 40 to 50 percent of the rate paid to experienced plumbers or pipefitters and increase every 6 months.


Pipefitters often have to work in confined spaces.

Many plumbers and pipefitters are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada. Some plumbers and pipefitters who have become contractors are members of the Associated Builders and Contractors, the Mechanical Contractors Association of America, and the National Association of Plumbing-Heating-Cooling Contractors.

Related Occupations

Other occupations in which workers install and repair mechanical systems in buildings are boilermakers, electricians, elevator constructors, environmental control system installers and servicers, hot air furnace installers and repairers, millwrights, oil burner servicers and installers, and sheet-metal workers.

Sources of Additional Information

For information about apprenticeships or work opportunities in plumbing and pipefitting, contact local plumbing, heating, and air-conditioning contractors; a local chapter of the Mechanical Contractors Association; a local of the union mentioned above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of plumbers, pipefitters, and sprinklerfitters, contact:

National Association of Plumbing-Heating-Cooling Contractors, 180 S. Washington St., Falls Church, Va. 22046.

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

National Fire Sprinkler Association, P.O. Box 1000, Patterson, N.Y. 12563.

Mechanical Contractors Association of America, 5410 Grosvenor Lane, Suite 120, Bethesda, Md. 20814.

Roofers

(D.O.T. 866.381-010, -014, and .684-010)

Nature of the Work

A leaky roof can damage ceilings, walls, and furnishings. To keep out water, roofers install and repair various kinds of materials such as tar and gravel, rubber, and shingles made of slate, asphalt, fiberglass, wood, or tile. Reroofing—installing new roofs on existing buildings—accounts for about 70 percent of all roofing work. Roofers also may waterproof foundation walls and floors.

There are two types of roofs, flat and pitched (slanted). Most commercial and industrial buildings have flat roofs. Most houses have pitched roofs. Roofers may work with both types, although many roofing contractors specialize in residential installation and repair. A roofer's work varies with the type of roof and roofing involved.

Most flat roofs are covered with several layers of materials. Roofers first put a layer of insulation on the roof deck. They then spread a coat of hot bitumen (a tar-like substance) over the roof's insulation. Next, they lay roofing felt (fabric saturated in bitumen) over the entire surface. Roofers then use a mop to spread hot bitumen over and under the felt. This seals the seams and makes the surface watertight. Roofers repeat these steps to build up the desired number of layers (called plies). The top layer is sometimes glazed to make a smooth finish, or gravel is embedded while it is still hot.

Some flat roofs are covered with a single ply often made of waterproof rubber. Roofers roll the rubber sheets over the roof's insulation, and seal the seams. An adhesive and block or stone ballast hold the sheets in place.

Most house roofs are covered with shingles. When applying shingles, roofers first lay, cut, and tack 3-foot strips of roofing felt lengthwise over the entire roof. Then, starting from the bottom edge, they nail overlapping rows of shingles to the roof. Workers measure and cut the felt and shingles to fit intersecting roofs, and to fit around vent pipes and chimneys. Wherever two roof surfaces intersect or shingles reach a vent pipe or chimney, roofers cement or nail flashing (strips of metal or shingle) over the joints to make them watertight. Finally, roofers cover exposed nailheads with cement to prevent water leakage.

Applying a built-up roofing system requires a team effort.

Some roofers also waterproof and dampproof masonry and concrete walls and floors. To prepare surfaces for waterproofing, they hammer and chisel away rough spots or remove them with a rubbing brick before brushing on a coat of liquid waterproofing compound. They also may paint or spray surfaces with a waterproofing material or attach waterproofing fabric to surfaces. When dampproofing, they usually spray a coating of tar on interior or exterior surfaces.

Working Conditions

Roofers' work is strenuous. It involves heavy lifting, as well as climbing, bending, and kneeling. Roofers risk injuries from slips or falls from scaffolds, ladders, or roofs, and burns from hot bitumen. In fact, of all construction industries, the roofing industry generally has the highest accident rate. Roofers work outdoors in all types of weather, particularly when making repairs. Roofs are extremely hot during the summer.

Employment

Roofers held about 122,000 jobs in 1984. Most roofers work for roofing contractors. Some work for businesses and government agencies that do their own construction and repair work. About 1 out of every 3 roofers is self-employed.

Training, Other Qualifications, and Advancement

The majority of roofers acquire their skills informally by working as helpers for experienced roofers. They start by carrying equipment and material and erecting scaffolds and hoists. Within 2 or 3 months they are taught to measure, cut, and fit roofing materials. Soon, they are able to lay asphalt or fiberglass shingles. It can take 5 years or more to get experience installing all types of roofing materials, because some materials are not used frequently.

Some roofers train through 3-year apprenticeship programs administered by local union-management committees. The apprenticeship program generally consists of a minimum of 1,400 hours of on-the-job training annually, in addition to 144 hours of classroom instruction in subjects such as tools and their use, arithmetic, and safety. On-the-job training for apprentices is similar to that for helpers, except that the apprenticeship program is more structured. Apprentices also learn to dampproof and waterproof walls.

Good physical condition and a good sense of balance are essential. A high school education or its equivalent is helpful, as are courses in mechanical drawing and basic mathematics. Applicants for apprenticeship programs must be at least 18 years old.

Roofers may advance to supervisor or estimator for a roofing contractor or become contractors themselves.

Job Outlook

Employment of roofers is expected to increase about as fast as the average for all occupations through the mid-1990's. Because turnover is high, the need to replace experienced roofers who leave the occupation will account for most job openings. Jobs should be easiest to find during spring and summer when most roofing is done.

Most buildings need new roofs about every 10 to 20 years depending upon the type of roofing material and the area of the country. Some roofing materials, such as slate, tile, or cedar, will last for 50 years or more with proper care. As the number of buildings grows, more roofers will be needed to do the additional reroofing work.

Roofing is less sensitive to general economic conditions than other construction occupations. Because reroofing accounts for most of the roofer's work, employment opportunities are not tied to the level of new construction, which tends to fall during economic downturns.

Earnings

Median weekly earnings for roofers working full time were about $285 a week in 1984. One-half earned between $220 and $485 a week. The top 10 percent earned more than $620 weekly.

Apprentices usually start at 55 percent of the skilled roofer's pay rate and receive increases every 6 months. Annual earnings for roofers, however, generally are lower than weekly earnings would indicate because poor weather limits the amount of time they can work.

Some roofers are members of the United Union of Roofers, Waterproofers and Allied Workers.

Related Occupations

Roofers use different types of shingles, bitumen and gravel, or other materials to waterproof building surfaces. Workers in other occupations who cover surfaces with special materials for protection and decoration include carpenters, concrete masons, drywall applicators, floor covering installers, glaziers, plasterers, terrazzo workers, and tilesetters.

Sources of Additional Information

For information about roofing apprenticeships or work opportunities in this trade, contact local roofing contractors; a local of the union previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For information about the work of roofers, contact:

National Roofing Contractors Association, 8600 Bryn Mawr Ave., Chicago, Ill. 60631.

Sheet-Metal Workers

(D.O.T. 804.281-010 and -014)

Nature of the Work

Sheet-metal workers make, install, and maintain a variety of sheet-metal products for homes and commercial and industrial buildings. These products include ducts for air-conditioning, heating, and ventilating and pollution control systems, kitchen equipment, roofs, siding, rain gutters, skylights, and outdoor signs. Some workers specialize in fabrication, installation, or maintenance, but most do all three jobs. (This statement covers only sheet-metal workers employed in the construction industry. It does not include those employed in the mass production of sheet-metal products.)

Sheet-metal workers usually fabricate their products at a shop away from the construction site. Working from blueprints or instructions from supervisors, they measure, cut, bend, shape, and fasten pieces of sheet metal to make duct work, counter tops, and other custom products. In many shops, workers use computerized metalworking equipment. This enables them to determine the layout that would result in the least waste of material. Sheet-metal workers then cut or form the parts with computer-controlled saws, shears, and presses. In some shops, workers cut parts with computer-controlled lasers. In shops without computerized equipment and for products that cannot be made on such equipment, sheet-metal workers lay out the work using tapes, rulers, and hand calculators to do the required mathematics. They cut or stamp the parts with machine tools.

Sheet-metal workers use tapes, rulers, and other measuring devices to check parts and may do finishing work with handtools such as handshears and hacksaws. After the parts have been cut and shaped, sheet-metal workers fasten the seams and joints together with bolts, cement, drive slips, rivets, solder, or by welding.

At the construction site, sheet-metal workers assemble and install pieces fabricated at the shop. They also use hammers, shears, and drills to make parts by hand at the worksite and to alter parts made in the shop.

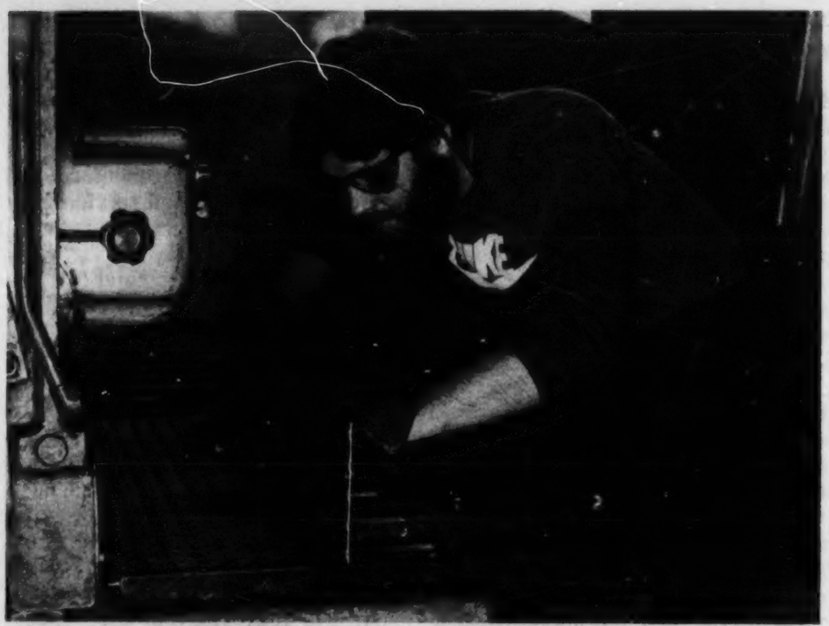
Workers install ducts, pipes, and tubes by joining them end to end and hanging them with metal hangers secured to a ceiling or a wall. To hold the pieces together, workers may bolt, weld, rivet, glue, or solder, or use specially formed sheet-metal drive slips.

Molded and pressed sheet metal, such as roofing and siding, usually is measured and cut on the job. After securing the first panel in place, workers interlock and fasten the grooved edge of the next panel into the grooved edge of the first. They nail or weld the free edge of the panel to the structure. This two-step process is repeated for each additional panel. Finally, at joints, along corners, and around windows and doors, workers fasten machine-made molding for a neat, finished effect.

Some sheet-metal workers specialize in testing, balancing, adjusting, and servicing existing air-conditioning and ventilation systems to make sure they are functioning properly and to improve their energy efficiency.

Working Conditions

Sheet-metal workers do considerable bending, lifting, standing, and squatting in close quarters or in awkward positions. They often work high above ground. They may get cuts and burns



Sheet-metal workers generally work indoors and lose less worktime than other construction workers due to weather.

from materials and tools. Because most work is done indoors, sheet-metal workers generally lose less work time than other construction workers due to bad weather.

Employment

Sheet-metal workers held about 100,000 wage and salary jobs in the construction industry in 1984. Construction employers include roofing, sheet-metal, and air-conditioning and heating contractors and general contractors engaged in residential, industrial, and commercial building. Very few sheet-metal workers are self-employed. Jobs for sheet-metal workers are distributed throughout the country in about the same proportion as the total population.

Training, Other Qualifications, and Advancement

Sheet-metal contractors consider apprenticeship the best way to learn this trade, although many workers learn informally on the job. The apprenticeship program usually consists of 4 years of on-the-job training and related classroom instruction. The programs are administered by joint committees of locals of the Sheet Metal Workers' International Association and local chapters of the Sheet Metal and Air-Conditioning Contractors' Association, or by local chapters of the Associated Builders and Contractors. The apprenticeship agreement usually provides a worker on-the-job experience in most aspects of the trade. Apprenticeship also is the best way to learn the mathematics needed for layout work.

On the job, apprentices use the tools, machines, equipment, and materials of the trade. They learn to measure, cut, bend, fabricate, and install sheet metal. They begin with duct work and gradually advance to more difficult jobs, such as making complex ducts, fittings, and decorative pieces. Toward the end of their training, they use materials such as pressed fiberglass, plastics, and acoustical tile, which may be substituted for metal on some jobs.

In the classroom, apprentices learn drafting, blueprint reading, trigonometry and geometry applicable to layout work, the use of computerized equipment, welding, and the principles of heating, air-conditioning, and ventilating systems. Safety is stressed throughout the program. In addition, apprentices learn the relationship between sheet-metal work and other construction work.

Workers who pick up the trade informally usually begin by carrying metal and cleaning up debris in a metal shop while they learn about materials and tools and their uses. Then, as employers permit, helpers learn to operate machines that bend or cut metal. In time, helpers go out on the job site to learn installation.

Applicants for jobs as apprentices or helpers should be in good physical condition and have mechanical aptitude. Local apprenticeship committees and employers may require a high school or vocational school education. Courses in trigonometry, geometry, mechanical drawing, and shop provide a helpful background for learning the trade.

Sheet-metal workers may advance to supervisory jobs or may go into the contracting business. Because a sheet-metal contractor must have a shop with equipment to fabricate products, this type of contracting business is more expensive to start than other types of construction contracting.

Job Outlook

Employment of sheet-metal workers in construction is expected to increase about as fast as the average for all occupations through the mid-1990's. Most openings will arise as experienced workers leave the occupation, retire, or die. Relatively few sheet-metal workers transfer to another occupation, reflecting the lengthy apprenticeship most workers have completed.

More sheet-metal workers will be needed to install air-conditioning and heating duct work and other sheet-metal products in new houses, stores, offices, and other buildings. A growing demand for new, more energy-efficient air-conditioning and heating systems in existing buildings also will boost employment opportunities for sheet-metal workers. Installation of solar heating equipment and decorative sheet metal will provide additional demand. While computerized equipment will increase the efficiency of the contractor's shop, the use of this equipment is not expected to significantly dampen the demand for sheet-metal workers since workers will be needed to run the equipment in the shop and to install the products at the job site.

Although employment of sheet-metal workers is expected to increase over the long run, workers may experience periods of unemployment when construction projects end and when economic conditions reduce the amount of construction. However, employment of sheet-metal workers is less sensitive to declines in new construction than employment of some other construction workers, such as carpenters. Maintenance of existing sheet-metal equipment—which is less affected by economic fluctuations than new construction—makes up a large part of the work done by sheet-metal workers. Installations of new air-conditioning and heating systems in existing buildings also continue during construction slumps as individuals and businesses seek more energy-efficient equipment to cut utility bills.

People wishing to enter sheet-metal apprenticeships will face keen competition for positions because high wages and good training attract many people.

Earnings

Median weekly earnings of full-time sheet-metal workers were about $405 in 1984. Most earned from $315 to $535 weekly. The top 10 percent earned more than $680 a week, while the bottom 10 percent earned less than $240 a week.

A large proportion of sheet-metal workers are members of the Sheet Metal Workers' International Association. In some areas, these union workers receive financial aid from their union when they are unemployed. Apprentices generally start at 40 percent of the rate paid to experienced sheet-metal workers and usually earn pay raises every 6 months during their apprenticeship.

Related Occupations

Other occupations in which workers lay out and fabricate metal products include layout workers, machinists, metal fabricators, metal patternmakers, shipfitters, and tool-and-die makers.

Sources of Additional Information

For more information about apprenticeships or other work opportunities, contact local sheet-metal contractors or heating, refrigeration, and air-conditioning contractors; a local of the union mentioned above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about sheet-metal workers, contact:

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

Structural and Reinforcing Metal Workers

(D.O.T. 801.361-014, -018, -022, .381-010, and .684-026)

Nature of the Work

Structural and reinforcing metal workers, also known as ironworkers, erect the steel framework of buildings, bridges, and other structures. In addition, they install steel stairs, window guards, and railings on buildings, and do repair work, such as replacing metal bridge parts. They also position steel bars and wire mesh to reinforce concrete floors, columns, and other structural spans.

High-rise buildings, bridges, and power transmission towers have frames made of steel columns, beams, and girders. Structural metal workers erect these steel frames and assemble the cranes and derricks that move structural steel, reinforcing bars, buckets of concrete, and other materials around the construction site. The hoisting equipment arrives at the construction site in sections, where it is lifted into position by a mobile crane. Ironworkers then connect the sections and set up the cables that do the hoisting.

Working from blueprints or instructions from supervisors, these workers erect frameworks by connecting steel columns, beams, and girders. The steel is delivered to the construction site ready for assembly—cut to the proper size with holes drilled in the ends for bolts, and numbered to indicate how pieces fit together. Ironworkers unload and stack the steel so it can be hoisted easily when needed.

To hoist the steel, the ironworkers attach cables from the crane or derrick. One worker directs the hoisting equipment operator with hand signals. Another worker holds a rope attached to the steel to prevent it from swinging. The steel is hoisted into place in the framework, where several workers are waiting. As the steel on the hoisting cable is lowered, the workers position it with connecting bars, jacks, and handtools. Workers use driftpins or the handle of a spud wrench—a long wrench with a pointed handle—to align the holes in the piece of steel with the holes in the framework. Then they bolt the piece in place temporarily. The workers check vertical and horizontal alignment with plumb bobs and levels and bolt or weld it permanently in place.

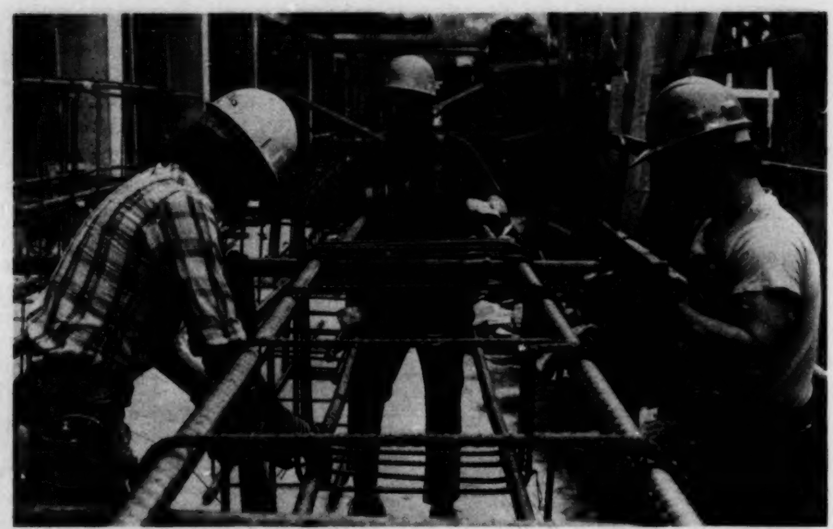
Reinforced concrete—concrete containing steel bars or wire mesh—is an important material in buildings, bridges, and other structures. The steel gives the concrete additional strength. Reinforcing metal workers set the bars in the forms that hold concrete, following blueprints that show the location, size, and number of reinforcing bars to be used. They fasten the bars together by wrapping wire around them with pliers. When reinforcing floors, workers place blocks or metal chairs under the reinforcing bars to hold them off the deck. These workers sometimes cut the bars with acetylene torches, bend them, or weld bars together with arc-welding equipment. When concrete is reinforced with a mesh made of welded wire, workers cut and fit the mesh before positioning it. While a concrete crew pours the slab, ironworkers use hooked rods to correctly position the wire mesh in the concrete mixture.

At construction sites, heavy structural steel and other materials or equipment may have to be moved. Ironworkers assemble the rigging—cables, pulleys, and hooks—to move materials and hook or bolt cables to both the hoisting equipment and the item to be moved. Workers then direct the load into position by giving hand signals and other directions to the hoisting machine operator.

Ironworkers also install metal stairways, catwalks, floor gratings, ladders, metal cabinets, and window frames, as well as lampposts, railings, fences, and decorative ironwork. In addition, they bolt or weld prefabricated aluminum, brass, and bronze frames and panels to buildings.

These workers also erect metal tanks used to store petroleum, water, or other fluids, and assemble prefabricated metal buildings according to plans or specifications.

Most ornamental metal is fabricated away from the construction site; ironworkers align and assemble it. They make sure ornamental pieces fit correctly and hold firmly. They cut oversized pieces to size and sometimes drill holes. For secure connections, they bolt, braze, or weld the metals.



Reinforcing iron workers coordinate efforts to wire-tie reinforcing bars.

Working Conditions

Structural and reinforcing metal workers usually work outside in all kinds of weather. However, those who work at great heights do not work when it is wet, slippery, because of snow or ice, or extremely windy.

Ironworkers may be injured in falls. However, they use safety devices such as safety belts, scaffolding, and nets to reduce the risk of injuries.

Ironworkers may have to travel long distances to their worksite because work available locally may be insufficient to keep crews employed.

Employment

Structural and reinforcing metal workers held about 90,000 jobs in 1984. Most of these workers are employed in the construction industry by general contractors and steel erection contractors. Some are employed by large steel companies engaged in the construction of bridges, dams, and large buildings. Some work for government agencies. Very few are self-employed.

Ironworkers are employed in all parts of the country, but most work in metropolitan areas where most commercial and industrial construction takes place.

Training, Other Qualifications, and Advancement

Most training authorities recommend an apprenticeship as the best way to learn this trade. However, a large number of ironworkers learn informally on the job.

Apprenticeship programs are administered by joint union-management committees made up of representatives of local unions of the International Association of Bridge, Structural and Ornamental Ironworkers and local chapters of contractors' associations. The apprenticeship consists of 3 years of on-the-job training and a minimum of 144 hours a year of classroom instruction.

In the classroom, apprentices study the basics of structural erecting, rigging, reinforcing, and ornamental assembling, as well as blueprint reading, the care and safe use of tools and materials, and mathematics for layout work. On the job, apprentices get experience in all aspects of the trade, such as unloading and storing materials at the job site, rigging materials for movement by crane or derrick, connecting structural steel, and welding.

Ironworkers who learn the trade informally generally do not receive classroom training, although some large contractors have extensive training programs. Nonapprentice trainees receive on-the-job training similar to the training of apprentices, but they are not guaranteed experience in all aspects of the trade.

Applicants for ironworker jobs generally must be at least 18 years old. A high school diploma may be preferred by employers and is required by most local apprenticeship committees. Courses in general mathematics, mechanical drawing, and shop provide a helpful background.

Because materials used in ironworking are heavy and bulky, ironworkers must be in good physical condition. Agility and balance also are required in order to work at great heights on narrow beams and girders.

Experienced workers can become supervisors. Ironwork offers relatively few opportunities for self-employment because the work requires large expenditures for materials and equipment.

Job Outlook

Employment of structural and reinforcing metal workers is expected to increase about as fast as the average for all occupations through the mid-1990's to meet rising demand for nonresidential buildings, power transmission towers, and highway and bridge construction and maintenance—types of construction that require extensive use of structural steel and reinforced concrete. However, most openings will result from the need to replace experienced ironworkers who transfer to other fields of work or leave the labor force.

The number of job openings will fluctuate from year to year as economic conditions change. Construction activity is sensitive to changes in the level of interest rates, the amount of business investment, and the level of government spending. When these conditions are unfavorable, the level of construction generally falls, reducing job openings for ironworkers.

Job opportunities for ironworkers also vary by geographic area. The level of construction activity reflects differences in local economic conditions. Therefore, the number of job opportunities in a given year may vary widely from area to area.

Job openings for ironworkers usually are more abundant during the spring and summer months, when the level of construction activity increases.

Many people are attracted to ironworker apprenticeship programs by the high wages, causing stiff competition for available positions.

Earnings

Median weekly earnings for ironworkers were about $430 in 1984. The middle 50 percent earned between $320 and $570 weekly. Apprentices start at 60 to 70 percent of the hourly rate paid to experienced workers, with increases every 6 months. Annual earnings for ironworkers, however, are generally lower than weekly earnings would indicate because the amount of time they work in a year can be limited by bad weather and the short duration of most jobs.

Many workers in this trade are members of the International Association of Bridge, Structural and Ornamental Iron Workers.

Related Occupations

Ironworkers play an essential role in erecting buildings, bridges, powerlines, and other structures. Other workers important in these types of construction are operating engineers, carpenters, and welders.

Sources of Additional Information

For more information on apprenticeships or other work opportunities, contact local general contractors; a local of the International Association of Bridge, Structural and Ornamental Iron Workers; a local joint union-management apprenticeship committee; a local or State chapter of the Associated Builders and Contractors, or the nearest office of the State employment service or apprenticeship agency.

For general information about ironworkers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Tilesetters

(D.O.T. 861.381-054, -058, and .684-018)

Nature of the Work

In ancient Egypt and Rome, tile was used for the design of mosaics—an art form using small, decorative ceramic squares. Tile also has been a popular building material over the years because it is durable, impervious to water, and easy to clean. It is used today, for instance, in food preparation areas, hospitals, and tunnels. Tilesetters, in a fashion similar to that of the ancient artists, apply tile to floors, walls, and ceilings.

To set tile, which generally ranges in size from 1/2 inch to 6 inches square, workers use cement or mastic (a very sticky paste). When using cement, tilesetters first tack a support of metal mesh to the wall or ceiling to be tiled. They use a trowel to apply a cement plaster, called a scratch coat, onto the metal screen and a tool, similar to a rake, to scratch the surface of the soft plaster. After the scratch coat has dried, tilesetters apply a rich coat of cement to the back of the tile and place it onto the surface.

To set tile in mastic or a cement adhesive (called "thin set"), tilesetters need a flat, solid surface such as drywall, concrete, plaster, or wood. They use a tooth-edged trowel to spread mastic on the surface or apply cement adhesive to the back of the tile and properly position it.

Since tile varies in color, shape, and size, workers sometimes prearrange tiles on a dry floor according to a specified design. This allows workers to examine the pattern and make any necessary changes.

Some tiles are cut with a machine saw or a special cutting tool to fit into corners and around pipes, tubs, and wash basins. Once the tile is placed, tilesetters gently tap the surface with their trowel handle or a small block of wood so the tiles seat evenly.

When the cement or mastic has set, tilesetters fill the joints with grout—a very fine cement. They then scrape the surface with a rubber-edged device called a squeegee to further dress the joints and to remove excess grout. Before the grout sets, tilesetters finish the joints with a damp sponge for a uniform appearance.

Working Conditions

Tilesetters generally work indoors. Since most of the structure has been completed, the work area is relatively clean and uncluttered. Much of the workday is spent bending, kneeling, and reaching, activities that require endurance but not exceptional strength. To protect their knees, some workers wear kneepads.

Although workers are subject to cuts from tools or materials, falls from ladders, and strained muscles, the occupation is not as hazardous as some other construction occupations.

Employment

Tilesetters held about 25,000 jobs in 1984. Most were employed by tilesetting contractors who work mainly on nonresidential construction projects, such as schools, hospitals, and office buildings. About 1 out of 3 tilesetters is self-employed.

Tilesetters are employed throughout the country but are found largely in urban areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend completion of a 3-year apprenticeship program, which consists of on-the-job training and related classroom instruction in subjects such as blueprint reading, layout, and basic mathematics.

Apprentices begin by familiarizing themselves with the tools of the trade. They are taught to mix and apply cement and to apply mastic. Then, they learn to cut and install tile, apply grout, and do finishing work.

A substantial proportion of tilesetters, however, acquire skills informally by working as helpers to experienced workers. They start by carrying supplies, cleaning work areas, and grouting and cleaning tile. Helpers learn to apply plaster scratch coat or spread adhesive. Eventually, they are taught to cut and set tile.

When hiring apprentices or helpers, employers usually prefer high school graduates who have had courses in general mathematics, mechanical drawing, and shop. Good physical condition, manual dexterity, and a good sense of color harmony also are important assets. Apprenticeship programs, while often recommended, may be more difficult to enter than other forms of training. In some localities, a written test and a physical examination are required.

Skilled tilesetters may become supervisors or start their own contracting businesses.

About 1 out of 3 tilesetters is self-employed.

Job Outlook

Employment of tilesetters is expected to increase about as fast as the average for all occupations through the mid-1990's. Although growth in demand for these workers will provide some new job opportunities, most will result from the need to replace tilesetters who retire or leave the occupation for other reasons. Because tilesetting is a small occupation, however, there will be relatively few job openings annually.

Population and business growth are expected to cause an increase in building construction and thus increase the demand for tilesetters. Tile is more likely to be used in more expensive homes, and the number of these homes is expected to increase. Tile floors are increasingly being used in entranceways and common areas of many office buildings, stores, and restaurants.

Employment of tilesetters, like that of many construction occupations, is sensitive to changes in the economy. Workers in this trade can experience periods of unemployment when construction activity is down. On the other hand, temporary shortages of tilesetters may occur in some areas during peak periods of building activity.

Earnings

Median weekly earnings for tilesetters were about $450 in 1984. Hourly wage rates for apprentices start at about 50 to 60 percent of the rate paid to experienced workers and increase periodically.

The principal union organizing workers in this trade is the International Union of Bricklayers and Allied Craftsmen. In addition, the Tile, Marble, Terrazzo Finishers, Shopworkers, and Granite Cutters International Union organizes the helpers associated with tilesetters.

Related Occupations

Tilesetters use their knowledge of tools and materials along with skill and dexterity to produce attractive, durable surfaces. Other workers with similar abilities include bricklayers, concrete masons, marblesetters, plasterers, stonemasons, and terrazzo workers.

Sources of Additional Information

For details about apprenticeship or other work opportunities in this trade, contact local tilesetting contractors; locals of the unions previously mentioned; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of tilesetters, contact:

International Union of Bricklayers and Allied Craftsmen, International Masonry Institute, Apprenticeship and Training, 815 15th St. NW., Washington, D.C. 20005.

Tile, Marble, Terrazzo Finishers, Shopworkers, and Granite Cutters International Union, 801 N. Pitt St., Suite 116, Alexandria, Va. 22314.

Extractive Occupations

The mining and petroleum drilling industries provide most of our Nation's fuels and raw materials. Oil and gas drilling supplies fuel for transportation, manufacturing, and home heating. Metallic mining produces iron, copper, and silver for manufacturing. Quarrying furnishes limestone and gravel for building. And coal mining provides fuel for generating electricity. The workers who drill for oil and gas and mine coal and metallic and nonmetallic ores make up the extractive occupations.

Extractive workers usually learn their skills on the job, working under the supervision of experienced workers. Physical strength, stamina, and mechanical aptitude often are the most important traits sought by employers. A high school diploma generally is not required but is preferred by some employers.

After receiving safety training, new workers are assigned to laborer jobs. Opportunities for training and promotion usually are based on seniority and ability to do higher level work. In many cases, union-management agreements set the rules governing training and promotion.

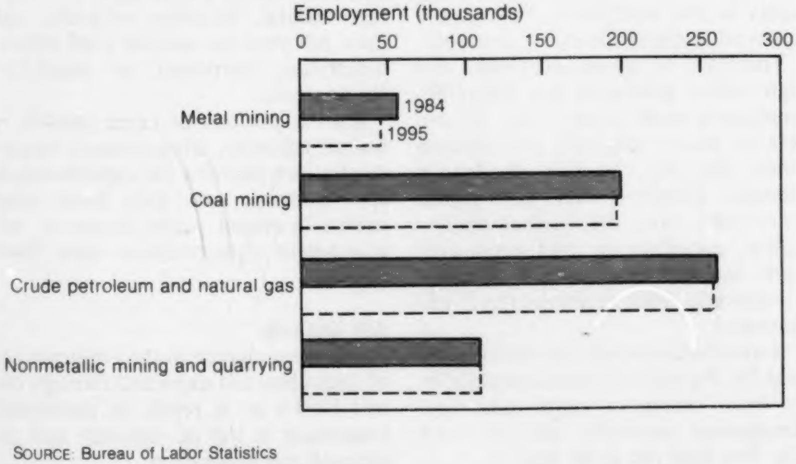
Extractive workers may advance to more highly skilled jobs. Some workers become supervisors; however, additional education is often needed to advance to higher supervisory or management jobs.

Overall, little or no change in employment in extractive occupations is expected through the mid-1990's. Coal mining and oil drilling account for most jobs. Demand for coal is expected to increase only moderately because electrical power generation, the major use of coal, is expected to grow little. The glut of oil is expected to limit demand for extractive workers in the oil drilling industry. Improvements in mining techniques and competition from foreign suppliers are also expected to limit employment growth over the long run.

The demand for oil, coal, and other natural resources is sensitive to changes in the level of economic activity. During economic downturns, extractive workers are subject to layoffs.

Extractive workers include rotary drillers, rotary derrick operators, blasters, miners, continuous-mining-machine operators, shale planer operators, shaft mechanics, quarry workers, jack setters, and rock-dust sprayers, among others. Detailed information on roustabouts—the largest extractive occupation—is presented in the following statement.

Employment in the extractive industries is expected to show little change through the mid-1990's.



Source: Bureau of Labor Statistics

Roustabouts

(D.O.T. 869.684-046 and 939.687-018)

Nature of the Work

Much of the routine physical labor and maintenance in and around oilfields and pipelines is performed by workers called roustabouts. They dig ditches or trenches for foundations or for drainage, load and unload trucks and boats, mix concrete, cut down trees and brush, and connect pipes and hydraulic hoses using handtools. They also may assemble and perform minor repairs on oilfield machinery and equipment—such as pumps, boilers, valves, and steam engines. With increasing mechanization in recent years, roustabouts now operate motorized lifts, power tools, and electronic testers, and have time to assume more maintenance responsibilities.

Most roustabouts work with crews around existing oil wells. Others work for companies engaged in drilling wells, almost all of which is done by specialized companies known as drilling contractors.

Roustabouts occasionally assist skilled workers such as welders, electricians, mechanics, painters, and carpenters. They generally work under the supervision of the supervisory or head maintenance operator.

Working Conditions

Working outdoors in all kinds of weather, roustabouts on offshore barges and platforms experience strong ocean currents, tides, and storms. Because roustabouts work around heavy materials and equipment such as drill rigs and cranes, their work is fairly strenuous and requires frequent bending, stooping, climbing, and heavy lifting. They also are subject to falls from rigs or derricks and other platforms, injuries from falling objects, cuts and abrasions from various tools and equipment, sore or strained muscles from

Roustabouts perform laborer and maintenance tasks.

heavy lifting, and health problems resulting from exposure to various chemicals.

Those who work offshore generally work 7 days a week, 12 hours a day, and then have 7 days off. Most live on the barge or platform for a week at a time and return to shore by helicopter or crewboat. In comparison, those who work onshore in oil production operations generally work regular 5-day, 40-hour weeks. Many drilling operations continue 24 hours a day until oil is discovered or the location is abandoned as a dry hole. This requires three 8-hour shifts or 'tours,' 7 days a week.

Roustabouts working with drilling crews may expect to move from place to place since their work in a particular field may be completed in a few months. Those who work on production wells usually remain in the same location for long periods.

Employment

Roustabouts held about 81,000 jobs in 1984. Over three-fourths of all jobs were in the oil and gas field services industry. The remaining jobs were in the crude petroleum and natural gas industry. Although drilling for oil and gas is done in a large number of States, about 85 percent of all workers are employed in eight States. Texas leads in the number of oilfield jobs, followed by Louisiana, Oklahoma, California, Colorado, Wyoming, Kansas, and New Mexico.

Most jobs are full-time, permanent positions. However, some roustabouts are hired on a temporary basis, such as students during the summer.

Training, Other Qualifications, and Advancement

People generally obtain jobs as roustabouts with little or no formal training or work experience. However, with more competition for jobs in recent years, an increasing proportion of entrants to this occupation have previous work experience as a roustabout.

There are no age requirements, and high school graduates are preferred. Applicants must be physically fit and able to pass a physical examination since the job requires moderate strength. Employers also seek candidates who have mechanical ability, agility, coordination, and good eyesight. Some companies also administer aptitude tests to prospective employees.

Roustabouts usually are hired in the field by the crew or division chief or by local company representatives. Companies generally hire workers who live near the work site.

Employers are often reluctant to invest in training because of the relatively high turnover rate among roustabouts. However, some employees are offered an opportunity to take basic self-study courses offered by the American Petroleum Institute. In some companies, roustabouts participate in educational assistance programs that pay for job-related courses taken on the employee's own time.

Most workers learn through on-the-job training under the supervision of a more skilled worker. Roustabouts start by performing basic laborer tasks such as unloading trucks and digging trenches. As they gain experience, they progress to more complex tasks such as fixing a motor or repairing a pump. During their training, they learn about the safety and maintenance of equipment and machinery and general oilfield operations. Those on maintenance and operation crews can advance to jobs as switcher, gager, lease operator, oil pumper, or, for those who demonstrate leadership qualities, to head maintenance operator. Roustabouts on drilling crews may advance to roughneck, floor hand, or rotary helper in 3 to 6 months. (Roughnecks guide pipe sections to and from oil well openings and help operate drilling machinery.) Roughnecks and other crew members may advance to derrick operator and, after several years, to rotary driller. A driller can advance to tool pusher in charge of one or more drilling rigs.

Roustabouts who are graduates of 1 1/2- to 2-year petroleum technology programs can advance to engineering technician or related jobs. Some attend company schools where they receive specialized training in electricity, welding, or other subjects, and later advance to various craft jobs—electrician, carpenter, or pipefitter, for example.

During periods of rapid growth in the oil industry, advancement opportunities are plentiful for capable workers. Because new jobs have been scarce in recent years, however, advancement opportunities have been limited.

Job Outlook

Little or no change in the employment of roustabouts is expected through the mid-1990's as a result of continued stagnation in the oil industry and increased mechanization.

Replacement needs will account for virtually all job openings in this occupation. Characteristic of entry level occupations, turnover among roustabouts is relatively high, particularly for those workers involved in offshore drilling. Some roustabouts find the work too strenuous or dirty and leave the occupation. Many people take roustabout jobs to earn money for a specific purpose—for example, a college education—and quit after a short time. Still others stay only long enough to acquire the minimum skills to advance into more highly skilled jobs.

During the middle to late 1970's, a worldwide shortage of oil gave U.S. firms the incentive to increase the supply of oil and resulted in massive hirings of new workers. However, more recent years have been characterized by a glut of oil. Major oil finds around the world increased the supply of oil while conservation of oil by industry and the public, in addition to a worldwide recession, reduced the demand for oil. This glut resulted in falling oil prices and a reduced incentive for the oil industry to expand rapidly.

Despite some slow improvement, few new roustabout jobs are expected in the foreseeable future. As a result, employers can continue to be selective in hiring. Thus, job opportunities will be best for persons with previous experience as a roustabout. Better job opportunities are expected on offshore rigs than in onshore activities.

Employment of roustabouts is sensitive to cyclical swings in the economy, particularly to the level of activity in the oil industry. During a slowdown in activity, roustabouts are subject to layoffs.

Earnings

In 1984, estimated earnings for roustabouts averaged $9.31 an hour. Roustabouts in the oil and gas field industry averaged $10.40 an hour. Those working offshore earned $11.22 an hour while onshore workers earned $9.77 an hour. Roustabouts working in the contract drilling industry earned $7.69 an hour. Those working onshore earned $8.25 an hour while offshore workers earned $7.57 an hour.

Most roustabouts are not members of unions. Only about one-fourth of all firms employing field operation workers and less than 5 percent of firms employing contract drilling workers were covered by union contracts. Workers in establishments with collective bargaining agreements were represented either by independent unions such as the Associated Petroleum Employees Union or by the Oil, Chemical, and Atomic Workers International Union, an AFL-CIO affiliate.

Related Occupations

Roustabouts assist skilled oilfield workers. Other laborers who assist skilled workers include blacksmith helper, construction laborer, dockhand, and material handler.

Sources of Additional Information

Information on job opportunities as a roustabout is available from local offices of the State employment service or oil companies. The names and addresses of oil companies are listed in either the *U.S.A. Oil Industry Directory* or the *Time Oil and Gas Directory*.

Production Occupations

Cars, gasoline, newspapers, eyeglasses, diamond rings, guided missiles, and most other products have at least one thing in common—they are made by production workers. Most production workers are found in manufacturing plants, but others work in settings as different as shoe repair shops, photofinishing laboratories, jewelry stores, and meat markets.

There are thousands of production occupations. In many, workers specialize in just one task in a process that mass produces a single product. A lens inserter, for example, fits lenses into eyeglass frames. In other production jobs, workers do a variety of tasks to produce many different goods. Machinists, for example, make precision metal parts for industrial machinery, completing all of the steps that are required to finish the product. Some workers perform simple, repetitive operations on large machine tools, while others—jewelers, for example—use handtools to do delicate work. Not all production workers turn out products, however. Some operate complex systems of boilers, generators, pumps, and valves that produce clean water or energy.

Training requirements for production workers vary widely. Some workers who do repetitive tasks can learn their job in a few days. Other jobs require years of experience. Many production workers learn their skills through apprenticeship programs that combine classroom instruction with on-the-job training. Others receive training in public and private vocational schools and in the Armed Forces.

Blue-collar worker supervisors work closely with the people they supervise.

The occupational statements in this chapter describe in detail the work, training, and job outlook for 21 production occupations.

Blue-Collar Worker Supervisors

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

In any organization, someone has to be boss. For the millions of workers who assemble manufactured goods, service motor vehicles, lay bricks, unload ships, or perform any of thousands of other activities, a blue-collar worker supervisor is the boss. These supervisors direct the activities of other employees and frequently ensure that millions of dollars worth of equipment and materials are used properly and efficiently. While blue-collar worker supervisors are most commonly known as foremen or forewomen, they also have many other titles. In the textile industry, they are referred to as second hands; on ships, they are known as boatswains; and in the construction industry, they are often called overseers, strawbosses, or gang leaders.

Although titles may differ, the jobs of all blue-collar worker supervisors are similar. They tell other employees what work has to be done and make sure the work is done correctly. For example, manufacturing supervisors may inspect products during and after the production process to make sure that they conform to customer specifications and company standards. Loading supervisors at truck terminals assign workers to load trucks, and then check that the material is loaded correctly and that each truck is fully used. They may mark freight bills and record the load and weight of each truck. Mine car dispatchers control the transport of coal through underground mines.

Because they are responsible for the output of other workers, supervisors make work schedules and keep production and employee records. They plan employees' activities and must allow for unforeseen problems such as absent workers and machine breakdowns. Supervisors teach employees safe work practices and enforce safety rules and regulations. They also may demonstrate timesaving or laborsaving techniques to workers and insure that new employees are properly trained. They often assign trainees to work with experienced workers to learn different aspects of the job.

In addition to their other duties, blue-collar worker supervisors tell their subordinates about company plans and policies; recommend good performers for wage increases, awards, or promotions; and deal with poor performers by retraining them in proper methods, issuing warnings, or recommending that they be disciplined or fired. In companies where employees belong to labor unions, supervisors meet with union representatives to discuss work problems and grievances. They must know the provisions of labor-management contracts and run their operations according to these agreements.

Working Conditions

Although working conditions vary from industry to industry, most blue-collar worker supervisors work in a normal shop environment. They may be on their feet much of the time overseeing the work of subordinates and may be subjected to the noise and grime of machinery. Construction supervisors may work outdoors.

Since these supervisors are responsible for the work of other blue-collar workers, they may work longer hours in order to be on the job before other workers arrive and after they leave. Although many supervisors work a 5-day, 40-hour week, others work in plants that operate around the clock and may have to work any one of three shifts—often on a rotating basis—as well as on weekends and holidays.

Foremen and forewomen sometimes are caught in the middle between the work force and management. New supervisors who are hired from outside the firm also may face initial hostility from workers who feel they should have been promoted to the job. For many supervisors, these problems are offset by the satisfaction that they may find in having more challenging and prestigious jobs than most blue-collar workers.

Employment

Blue-collar worker supervisors held about 1.5 million jobs in 1984. Although they are found in almost all businesses and government agencies, over half worked in manufacturing, supervising the production of cars, washing machines, and thousands of other products. Most of the rest worked in the construction industry, wholesale and retail trade, public utilities, transportation, and government agencies. Employment is distributed in much the same way as the population, and jobs are located in all cities and towns.

Training, Other Qualifications, and Advancement

When choosing supervisors, employers generally look for experience, job knowledge, organizational skills, and leadership qualities. Employers emphasize the ability to motivate employees, maintain high morale, command respect, and get along with people. The ability to communicate effectively, both orally and in writing, also is essential. Completion of high school often is the minimum educational requirement, and 1 or 2 years of college or technical school can be very helpful to workers who want to become supervisors.

Most supervisors rise through the ranks—that is, they are promoted from jobs where they operated a machine, worked on an assembly line, or at a construction craft. This work experience gives them the advantage of knowing how jobs should be done and what problems may arise. It also provides them with insight into employee attitudes towards management policies. Supervisors are sometimes former union representatives who are familiar with grievance procedures and union contracts. To supplement this work experience, many companies have training programs to help develop supervisory skills.

Although few blue-collar worker supervisors are college graduates, some employers hire trainees with a college or technical school background. This practice is most prevalent in industries with highly technical production processes, such as the aerospace, oil, and electronics industries. Employers generally prefer backgrounds in engineering, business administration, industrial relations, mathematics, or science. New employees undergo on-the-job training until they are able to accept supervisory responsibilities.

Outstanding supervisors, particularly those with college education, may move up to higher management positions. In manufacturing, for example, they may advance to jobs such as department head and plant manager. Some supervisors, particularly in the construction industry, use the experience and skills they gain to go into business for themselves.

Job Outlook

Employment of blue-collar worker supervisors is expected to increase more slowly than the average for all occupations through the mid-1990's. Although rising incomes will stimulate demand for goods such as air-conditioners, home entertainment equipment, personal computers, and automobiles, employment in manufacturing industries will grow slowly due to increasing foreign competition. This will dampen demand for supervisors. Although most of these supervisors will continue to work in manufacturing, a large part of the increase in jobs will be in nonmanufacturing industries, especially in the trade and service sectors.

In addition to the jobs resulting in increased demand for supervisors, many openings will arise from the need to replace workers who leave their occupation. Supervisors have a relatively strong attachment to the occupation, but because the occupation is so large, turnover results in a large number of openings.

Because blue-collar worker supervisors are so important to the successful operation of a firm, they are often protected from layoffs during a recession. Supervisors in the construction industry, however, may experience periodic layoffs when construction activity declines.

Earnings

Median weekly earnings for blue-collar worker supervisors were about $460 in 1984. The middle 50 percent earned between $350 and $630. The lowest 10 percent earned less than $265 and the highest 10 percent earned over $790. Supervisors receive a salary determined by the wage rates of the highest paid workers they supervise. For example, most companies keep wages of supervisors about 10 to 30 percent higher than those of their subordinates. Some supervisors receive overtime pay.

Related Occupations

Other workers with similar supervisory duties include those who supervise professional and technical, sales, clerical, and service workers. Some of these are retail store or retail department managers; bank officers and head tellers; hotel managers, housekeepers, and assistants; postmasters and line supervisors; head cooks; head nurses; and surveyors.

Sources of Additional Information

A bibliography of literature on management occupations is available from:

American Management Association, 135 West 50th St., New York, N.Y. 10020.

Precision Production Occupations

The workers discussed in this section of the *Handbook* produce goods that must meet rigid quality standards. In addition, many of these workers must interpret very detailed instructions and specifications. Tool makers, for example, produce tools such as guides for drill presses that must be made to precise specifications because they are used to make hundreds or even thousands of identical parts. To do the job correctly, the tool maker must be able to read and follow exactly the blueprints provided by the tool designer.

There are no universal training requirements for these workers. Most precision production jobs can be learned informally—starting as a helper and observing experienced workers. Some companies offer in-house training programs on specific areas of the work. The preferred training for many of the more highly skilled occupations—machinists, tool-and-die makers, and lithographers, for example—is completion of a formal apprenticeship program after completing high school. These programs, which usually last from 3 to 5 years, combine classroom instruction with on-the-job training.

Job prospects for precision production workers vary widely. While new technologies and foreign competition will limit job growth in some occupations, other precision production occupations will enjoy strong growth. See the *Handbook* statements that follow for information on the job outlook in specific occupations.

Boilermakers

(D.O.T. 805.261 .361, and .381)

Nature of the Work

Boilers, vats, and other large vessels that hold liquids and gases are essential to many industries. Boilers, for example, supply the steam that drives the huge turbines in electric utility plants and ships. Tanks and vats are used to process and store chemicals, oil, beer, and hundreds of other products. Boilermakers assemble, erect, and repair these vessels and related equipment.

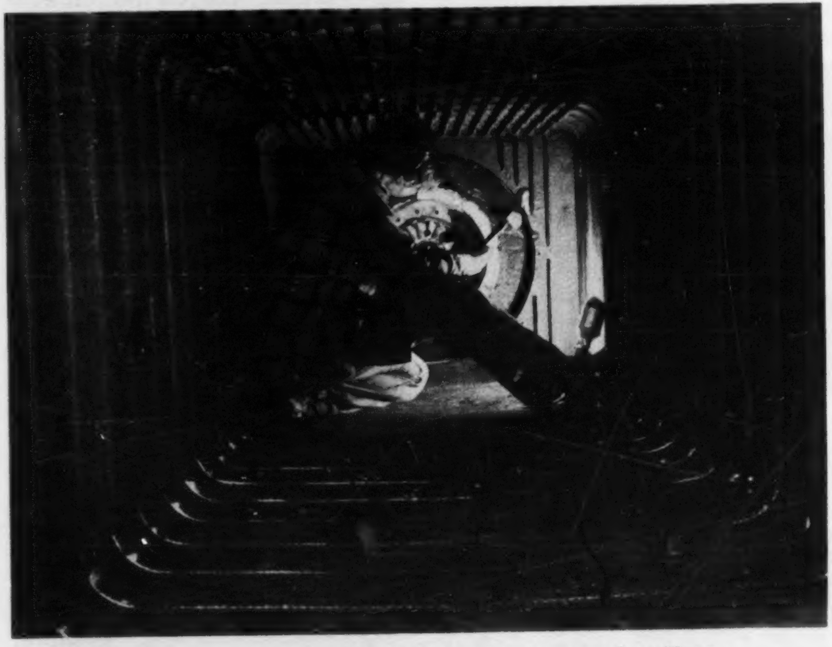
Boilermakers follow blueprints and templates in marking off lines, curves, holes, and dimensions on metal plates and tubes used to make the various parts of a boiler, vat, or tank. Markings must be planned and measured carefully, allowing for the curvature and thickness of the metal. Because errors in size or shape may be difficult or impossible to correct after the metal is cut, these workers use instruments, such as compasses, protractors, gauges, and scales, to make precise measurements.

After they cut and shape the metal to specifications, boilermakers use bolts or temporary welds, called tackwelds, to hold the parts in place while they check to see that parts line up according to the blueprints. They use grinders or cutting torches to remove excess metal, and welding machines to fill in small gaps. A new piece may have to be cut for large gaps.

Small boilers may be assembled at the plant where they are made; however, once the pieces for a larger boiler or tank have been cut out and checked for proper fit, they are transported to the shop or construction site for installation. There, boilermakers assemble and erect the vessels using rigging equipment such as hoists and jacks to lift heavy metal parts into place, and then weld or rivet the parts together. Because installation work must meet statutory safety standards, boilers are carefully tested for leaks and other defects.

Boilermakers also install auxiliary equipment on boilers and other vessels. For example, they install vapor barriers on open-top oil, gas, and chemical storage tanks to prevent fumes from polluting the air, and air pollution control equipment, such as precipitators and smoke scrubbers, in electric plants that burn high-sulfur coal.

Some highly skilled boilermakers (called mechanics) also maintain and make repairs so that boilers remain safe and in good working condition. For example, when boilers occasionally develop leaks, boilermaker mechanics may dismantle the boiler,



Boilermakers may spend hours working in stooped and cramped positions.

patch weak spots with metal stock, replace defective sections, or strengthen joints.

Working Conditions

When laying out, fitting, assembling, or repairing boilers, workers often use potentially dangerous equipment, such as acetylene torches and power grinders, and handle heavy materials. Work may be done in cramped quarters inside boilers, vats, or tanks, which are often damp and poorly ventilated. Because workers occasionally work at great heights on top of large vessels, this occupation is more hazardous than many other metalworking occupations. To reduce the chance of injuries, many workers wear protective equipment, such as safety harnesses, safety glasses, and helmets. Boilermakers occasionally work nights or weekends to meet construction or production deadlines.

Employment

Boilermakers held about 38,000 jobs in 1984, reflecting the slow recovery in boiler manufacturing activity from the 1981-82 recession as well as the recent slowdown in electric powerplant construction. About 4 of every 10 boilermakers work in the construction industry, mainly assembling and erecting boilers and other pressure vessels. In addition, many work in the maintenance and repair departments of iron and steel plants, petroleum refineries, railroads, shipyards, and electric powerplants. Large numbers also work for boiler repair firms and in Federal Government installations, principally in Navy shipyards and Federal powerplants. Boilermakers who lay out and fit structural parts together work mainly in plants that make fire-tube and water-tube boilers, heat exchangers, heavy tanks, and similar products.

Training, Other Qualifications, and Advancement

Most training authorities agree that a formal apprenticeship is the best way to learn this trade. Nevertheless, many people become boilermakers by working for several years as helpers to experienced boilermakers. Apprenticeship programs are administered by joint union-management committees and usually consist of 4 years of on-the-job training, supplemented by about 150 hours of classroom instruction each year in subjects such as blueprint reading, shop mathematics, and welding.

Helpers who learn the craft by working with experienced boilermakers generally reach the journeyman level after at least 4 years on the job. They generally lack the wide range of skills acquired through the apprenticeship process, however.

When hiring apprentices or helpers, employers prefer high school or vocational school graduates. A high school diploma usually is required to participate in a formal apprenticeship program. Courses in shop, mathematics, blueprint reading, welding, and machine metalworking provide a useful background for all boilermaking jobs. Most firms require applicants to pass a physical examination because good health and the capacity to do heavy work are necessary in these jobs. Mechanical aptitude and the manual dexterity needed to handle tools also are important qualifications.

Boilermakers who become skilled in the practical and technical aspects of the trade may advance to supervisory positions.

Job Outlook

Employment of boilermakers is expected to increase more slowly than the average for all occupations through the mid-1990's. Most openings will arise each year from the need to replace experienced workers who transfer to other fields of work or retire.

The expected construction of many new electric powerplants will create a need for additional boilers and will cause employment of boilermakers to increase. However, an anticipated slowdown in other industries that use boiler products, such as chemical and petroleum refining, would offset much of this increase.

Most of the industries that purchase boilers are sensitive to economic conditions. Therefore, during economic downturns some boilermakers may be laid off, and some may have to move from one area of the country to another to find employment. Because existing boilers must be maintained and repaired even during economic downturns, boilermaker mechanics generally have more stable employment. When economic activity declines, some experienced construction boilermakers move into mechanic positions.

Earnings

Median hourly earnings of full-time boilermakers were about $11.25 in 1984; the middle 50 percent earned between $8.75 and $15. The lowest 10 percent earned less than $6.25, and the top 10 percent earned more than $15.25. In general, boilermakers in construction earn the highest hourly wages. Hourly wage rates for many union boilermakers employed in fabricated plate work and in the petroleum and shipbuilding industries ranged from about $10 to $14 in 1984. In contrast, the average hourly wage for all nonsupervisory workers in private industry, except farming, was $8.33.

Most boilermakers belong to labor unions. The principal union is the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. Other workers are members of the International Association of Machinists and Aerospace Workers; United Automobile, Aerospace, and Agricultural Implement Workers of America; and the United Steelworkers of America.

Related Occupations

Workers in a number of other occupations assemble, install, or repair metal equipment or machines. These include assemblers, blacksmiths, instrument makers, ironworkers, machinists, millwrights, patternmakers, plumbers, sheet-metal workers, tool-and-die makers, and welders and others.

Sources of Additional Information

For further information regarding boilermaking apprenticeships or other training opportunities, contact local offices of the unions previously mentioned, local construction companies and boiler manufacturers, or the local office of the State employment office.

Bookbinding Workers

(D.O.T. 653.360-010, -014 and -018, .380-010, .382-010, .562-010, .585-010, .662-010, .680-010, .682-010, -014, -018 and -022, .685-010, -014, -022, -026 and -030; 692.685-146; 977.381-010 and -014)

Nature of the Work

Bookbinding—the assembly of books in quantity from large, flat, printed sheets of paper—is one of the most complicated occupations of the printing industries. Skilled bookbinders (D.O.T. 977.381-010) operate machines that first fold the printed sheets into units, known as "signatures," so that the pages will be in the right order. They then insert any illustrations that have been printed separately, gather and assemble signatures in proper order, and sew them together. They shape the book bodies with presses and trimming machines and reinforce them with glued fabric strips. Covers are glued or pasted onto the book bodies, and then the books undergo a variety of finishing operations, often including wrapping in paper jackets. Machines are used extensively throughout the process. Many skilled bookbinders also bind magazines.

Bookbinding workers seldom perform all the different binding tasks, although some have training in all of them. Some workers specialize in adjusting and preparing equipment to perform a particular job. Others operate specific equipment such as folding or gathering machines. In large shops, bookbinding workers may be assigned to one or a few operations, most often to the operation of complicated machines, such as a large papercutter or a folding machine. When necessary, they repair and adjust bindery equipment.

In many shops, much of the work is done by bindery workers who are trained to perform a few relatively simple tasks. For example, semiskilled bindery workers perform such tasks as fastening sheets or signatures together using a machine stapler and feeding signatures into various machines for stitching, folding, or gluing operations.

A small number of bookbinders work in hand binderies. These highly skilled workers design original or special bindings for limited editions or restore and rebind rare books. The work requires creative ability, knowledge of materials, and a thorough background in the history of binding. Hand bookbinding is perhaps the only kind of binding that gives the individual an opportunity to work at a variety of jobs.

Working Conditions

The job is physically demanding, as bookbinders do considerable lifting, standing, and carrying. Binderies are often noisy and smell of glue and paper.

Employment

Bookbinding workers held about 81,000 jobs in 1984, and were distributed as follows:

Bindery machine operators and bindery machine setters and setup operators	70,000
Precision bookbinders	11,000

Although some bookbinding jobs are in large libraries or in shops that specialize in bookbinding, most are in commercial printing plants. Few publishers maintain their own manufacturing facilities, so the printing of a book generally is contracted out to commercial printing plants.

Most bookbinders are employed full time.

Although bookbinding workers are found in all parts of the country, employment is concentrated in large printing centers such as New York, Chicago, Washington, D.C., Los Angeles, Philadelphia, and Dallas.

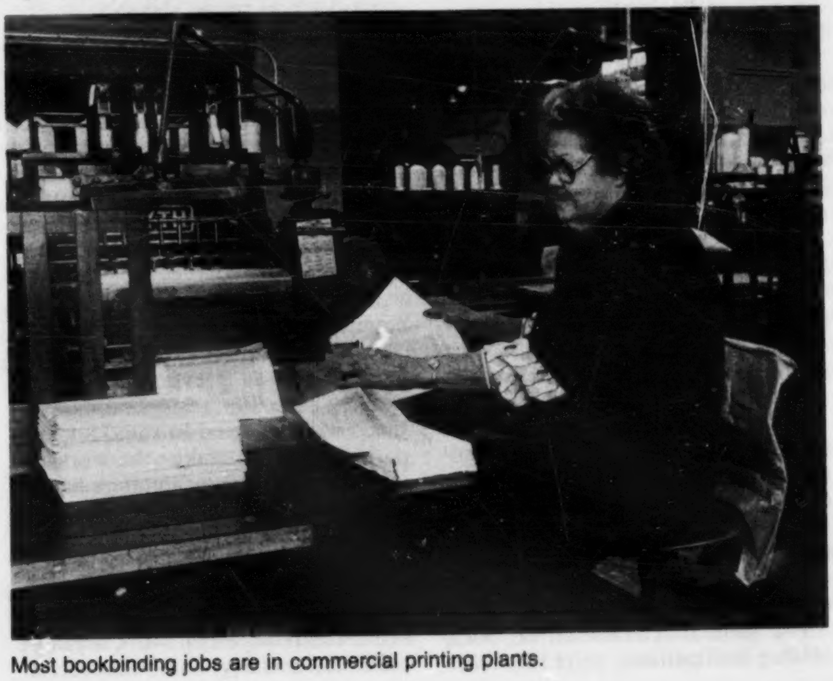
Training, Other Qualifications, and Advancement

Bookbinding workers learn the craft through on-the-job training or formal apprenticeship. Different levels of specialization and skill demand different amounts of training. Thus, a 5-year apprenticeship usually is necessary to teach workers how to restore rare books. A 4-year apprenticeship prepares workers to operate machinery such as signature folders, while a 2-year program imparts the skills needed to operate the stitching machine which sews the signatures together.

Apprenticeship applicants usually must have a high school education, mechanical aptitude, and be at least 18 years of age. In most plants, bookbinders are taught to operate and maintain at least three different pieces of bindery equipment.

For many, if not most bookbinding jobs, a formal apprenticeship is not necessary. On-the-job training is usually provided by the firm. Individuals with some knowledge of bookbinding are likely to have an advantage in being accepted for employer-provided training. High school students interested in bookbinding careers can gain some exposure to the industry by taking shop courses or attending a vocational technical high school. Occupational skill centers also provide an introduction to the industry. Postsecondary programs in the graphic arts are offered by vocational-technical institutes; journeyman up-date or retraining programs; and community and junior colleges. Four-year college programs help prepare people who may eventually move into management positions in the graphic arts industry.

Accuracy, patience, neatness, and good eyesight are among qualities needed by bookbinders. Good finger dexterity is essential for those who



Most bookbinding jobs are in commercial printing plants.

count, insert, paste, and fold. Artistic ability and imagination are required for hand bookbinding.

Advancement opportunities are limited. In large binderies, experienced bookbinders may advance to supervisory positions.

Job Outlook

Employment of bookbinding workers is expected to grow as fast as the average for all occupations through the mid-1990's in response to anticipated growth in commercial printing. A moderate increase in book publishing is expected as leisure time activities become more attractive. As in other occupations, however, most job openings will result from the need to replace experienced bookbinders who change jobs or leave the labor force.

While emphasis on productivity improvement is expected to continue in bindery operations, no radical technological changes are on the horizon. The bookbinding process is becoming increasingly mechanized through the use of technologies that perform a number of operations in sequence. As a result, labor requirements have been reduced, and jobs of many bindery workers who assisted skilled bookbinders in the past have already been eliminated.

Opportunities for hand bookbinders are limited by the small number of establishments that do this highly specialized work.

Earnings

The basic wage rate for skilled bookbinders varies across the country. According to the Graphic Communications International Union, hourly wage rates for bookbinders in unionized firms in 1984 were $11.46 for journeyman level I and $7.97 for level II.

Related Occupations

Other workers who set up and operate production machinery include papermaking machine operators, press operators, and precision machine operators.

Sources of Additional Information

Details about apprenticeships and other training opportunities may be obtained from local bookbinding shops, local offices of the Graphic Communications International Union, or local offices of the State employment service.

For general information on bookbinding occupations, write to:

Education Council of the Graphic Arts Industry, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Graphic Communications International Union, 1900 L St. NW., Washington, D.C. 20036.

Binding Industries of America, 200 E. Ontario St., Chicago, Ill. 60611.

Butchers and Meatcutters

(D.O.T. 316.681-010, .684-018, .684-022; 525.361-010, .381, .664-010)

Nature of the Work

Butchers and meatcutters prepare meat in supermarkets, wholesale food outlets, and meatpacking plants. They cut animal carcasses into wholesale cuts such as rounds, loins, ribs, and chucks to facilitate handling and marketing. They use knives and saws to separate wholesale cuts into retail cuts or individual size servings, such as steaks, chops, roasts, filets, and poultry parts. Boneless cuts are fabricated using knives, slicers, or power cutters while bandsaws are required on bone-in pieces. Meat trimmings are used to prepare hamburgers, sausages, and luncheon meats. Meatcutters in retail foodstores arrange and display meat items in refrigerated cases and assist customers.

This statement does not include processing operatives in meatpacking plants who may do only one cut of meat, such as round steaks.

Working Conditions

Working conditions vary by type and size of establishment. In large meatpacking plants and retail food establishments, butchers and meatcutters work in large modern meatcutting rooms equipped with power machines and conveyors. In small retail food establishments, the meatcutter may work in a space behind the meat counter.

Butchers and meatcutters work in cold rooms to prevent meat from spoiling. The low temperature, combined with the need to stand for long periods of time, makes the work tiring. Butchers and meatcutters have a greater incidence of injury than most other workers. To avoid injury, butchers and meatcutters must be careful when working with sharp tools—especially power tools. Health and safety standards require that work areas be clean and sanitary.

Employment

Butchers and meatcutters held 222,000 jobs in 1984. About half of the butchers and meatcutters were employed in retail foodstores. Some were employed in meat packinghouses and wholesale establishments. A few were employed by restaurants, hotels, hospitals, and other institutions. Jobs are located in almost every city and town in the Nation.

Training, Other Qualifications, and Advancement

Most butchers and meatcutters acquire their skills informally on the job or through apprenticeship programs. A few learn their basic skills by attending trade and vocational schools. However, graduates of these schools may need additional on-the-job training and experience to work as butchers and meatcutters. Packinghouse meatcutters usually start out as processing operatives and are trained informally on the job.

Generally, on-the-job trainees begin by doing odd jobs, such as removing bones. Under the guidance of skilled butchers and meatcutters, they learn the proper use of tools and equipment and how to prepare various cuts. After demonstrating skill with tools, they learn to divide quarters into wholesale cuts and wholesale cuts into retail and individual portions. Trainees may learn to roll and tie roasts, prepare sausage, and cure meat. Those in retail food establishments may learn marketing operations such as inventory control, meat buying, and recordkeeping.

Butchers and meatcutters who learn the trade through apprenticeship pro-

Meatcutters use saws to divide beef quarters into retail cuts.

grams generally complete 2 years of supervised on-the-job training supplemented by classroom work. At the end of the training period, apprentices must pass a meatcutting test. In some areas, apprentices may become meatcutters without completing the entire training program if they can pass the test.

Skills important in meatcutting are manual dexterity, good depth perception, color discrimination, and good eye-hand coordination. Also, strength is needed to lift and move heavy pieces of meat. A pleasant personality, a neat appearance, and the ability to communicate clearly are important qualifications for butchers and meatcutters who wait on customers. A health certificate may be required for employment.

Butchers and meatcutters may progress to supervisory jobs, such as meat department managers in supermarkets. A few become meat buyers for wholesalers and supermarket chains. Some become grocery store managers or open their own meat markets. In meatpacking plants, meatcutters move up to supervisory positions.

Job Outlook

Employment of butchers and meatcutters is expected to decline slightly through the mid-1990's. Nevertheless, thousands of jobs will be available each year because of the need to replace experienced workers who transfer to other occupations or leave the labor force. As the Nation's population grows, the demand for meat should increase. However, this increase in demand will be more than offset by the increasing prevalence of "boxing"—cutting and packaging meat at the meatpacking plant. In the future, even more cutting is expected to be shifted to meatpacking plants. Most meat in these plants is processed by operatives, rather than by meatcutters, so that fewer meatcutters will be needed. Prototypes of automated cutting equipment are being tested. However, each animal carcass is different, and these machines cannot yet adapt to the differences. They therefore are not likely to be widely used in the near future.

Earnings

Journeyman meatcutters earned between $11 and $16 an hour in 1985, according to a survey of union wage rates for grocery store employees in cities of 100,000 inhabitants or more. Earnings for meatcutters in meatpacking plants vary widely, depending on the size of plant, geographic location, and union contract.

Many butchers and meatcutters are members of the United Food and Commercial Workers International Union.

Related Occupations

Butchers and meatcutters must be skilled at both hand and machine work and must have some knowledge of processes and techniques involved in preparing food. Other occupations in food preparation which require similar skills and knowledge are bakers, cooks, and kitchen supervisors.

Sources of Additional Information

Information about work opportunities can be obtained from local employers or local offices of the State employment service. For information on training and other aspects of the trade, contact:

United Food and Commercial Workers International Union, 1775 K St. NW., Washington, D.C. 20006.

Compositors and Typesetters

(D.O.T. 203.362-018, .382-018 and -026, .582-042, -046, -062 and -074; 208.382-010; 650.582-010, -014, -018 and -022; 652.585-010, .685-106; 973.381-010, -014, -018, -022 and -030; 979.381-018 and -022)

Nature of the Work

In small shops, one person may do all the work needed to complete a printing job. In large shops, however, the work is divided among specialists. Among these are compositors, who prepare preliminary printing plates for pressroom workers who do the actual printing. Compositors specialize in typesetting either by "hot type," "cold type," or photocomposition.

There are several ways of setting and producing printed material. *Hand compositors* make up the oldest composing room occupation but exist only in "hot type" operations. Today, hand typesetting is rarely used except for small, specialty jobs where the setting of type by machine is impractical. Hand typesetters read from the copy and set each line of type, letter by letter, on a "composing stick," a device that holds type in place. They select the place where words will be divided and a hyphen placed if the word does not fit on a line, as well as adjust the spacing of the type with pieces of metal so that the line of type will be equal to the width of the column. As each "stick" is filled, they slide the completed lines into a shallow metal tray called "galley." Once the article is completed, the type is transferred from the galley to type frames used to hold the text together while in the printing press.

Linotype and monotype machine operators are craft workers who operate semiautomatic machines that set type much more rapidly than can be done by hand.

Linotype machine operators read from copy clipped to the machine and operate a keyboard to select letters and other characters. As they press the keys, metal molds of the letters are assembled into lines of words. After completing a line, operators touch a lever and the machine automatically fills the molds with molten lead, forming a line of type into a solid metal strip called a "slug." The slugs are assembled into the type frames from which printing plates are made.

Monotype keyboard operators also operate a keyboard machine. However, instead of selecting metal molds, the monotype machine produces a perforated paper tape. The operators feed the tape into a machine that reads the tape and automatically selects metal molds for each letter. The machine then forces molten metal into each mold to form the type.

While machines make their tasks easier, monotype and linotype machine operators must hyphenate and adjust type spacing to fit the width of columns. In small plants, operators also may maintain and repair typesetting machines.

The craft of composing and typesetting has been revolutionized by advances in technology, and very little typesetting will continue to be done by hand or with monotype and linotype machines. Together, photography and computers have changed the way written material and graphics are converted into print. Computer-generated typesetting is firmly established at most large daily newspapers, and some papers are using electronic pagination, or page makeup, systems.

With phototypesetting equipment, a photographic process replaces the casting of type, and the final product is a photographic positive film or paper of the type rather than a metal slug. In a common form of phototypesetting, a *phototypesetter* keyboards the text without regard to column width or hyphenation and produces a perforated paper or magnetic tape. The operator then feeds the tape containing the text into a computer that is programmed to hyphenate and create columns of text. The computer creates a second tape containing the text as it will appear when printed which phototypesetters insert into a photocomposition machine. This machine displays the individual characters on the tape and photographs them. The phototypesetter then develops films of the material to be printed.

After the copy is set, typesetters pass it to other compositors who arrange the columns of type, pictures, and illustrations according to the layout for each page submitted by the editor. If letterpress printing equipment is being used, arrangers assemble the metal type and photoengravings in a large metal frame that clamps all the pieces together. If lithographic film equipment is being used, they cut the film of type and pictures and tape the pieces in place.

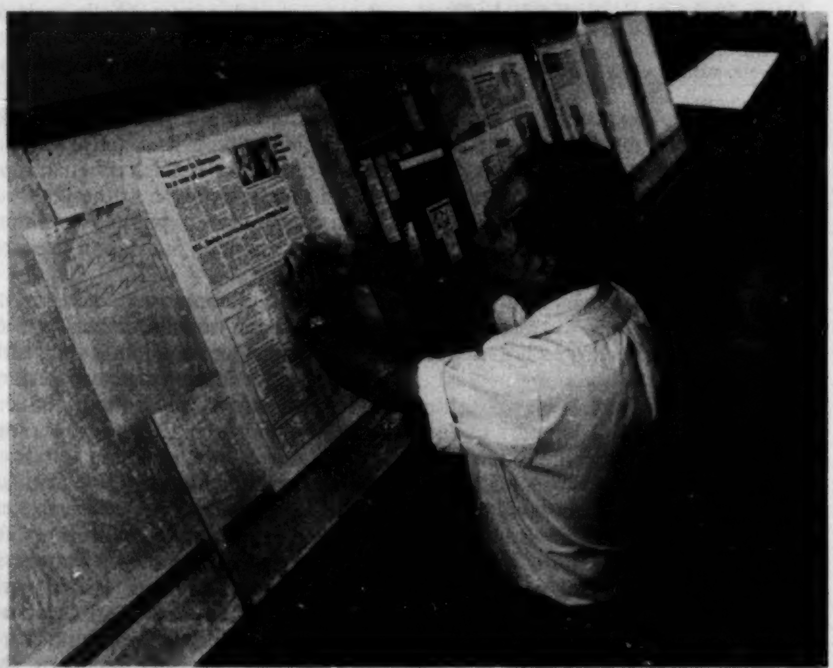
The most advanced method of typesetting, called electronic pagination, is in limited commercial use at present. Using phototypesetting equipment, an operator uses a keyboard to select the size and style of type, the column width, and appropriate spacing, as well as to store each character in a computer. The computer then displays and arranges columns of type on a screen that is similar to a TV screen. An entire newspaper page—complete with artwork and graphics—can be made up on the screen exactly as it will appear in print. Operators visually check the text and make any required corrections. The information is then transmitted to a machine that produces a film of the material.

After arranging all the pages of a particular job in proper sequence, compositors make page proofs to review the entire job. Page proofs are checked with the original copy for errors and returned to the editor for final changes. After final changes have been put into the type, the plate is sent to the pressroom where production printing plates are made.

Working Conditions

Hand compositors are on their feet most of the time and do some fairly heavy lifting. Typesetting machine operators sit for long periods of time. Monotype and linotype machines are very noisy. The work environment may be hot and dirty. However, phototypesetters usually work in clean, air-conditioned offices with little noise. Eyestrain from working in front of a video display terminal, as well as stress and musculoskeletal problems, such as backaches, can be a problem.

All compositors may be required to work overtime to meet publication deadlines; some regularly work evening or night shifts. Compositors employed by newspapers may work holidays and weekends.



A compositor checking his work.

Employment

Composing room workers held nearly 94,000 jobs in 1984. Employment was distributed as follows:

Compositors, typesetters, and arrangers	37,000
Typesetting and composing machine operators and tenders	36,000
Data keyers, composing	21,000

About 37 percent of all jobs were in newspaper plants and 23 percent were in commercial printing plants. The remainder were in other kinds of printing and publishing firms; in business firms, including mailing, reproduction, commercial art, and stenographic service establishments; and in a wide range of firms that do their own printing.

Composing room workers are located in almost every community throughout the country, but they are concentrated in large printing centers such as New York, Los Angeles, Washington, D.C., Philadelphia, Chicago, and Dallas.

Training, Other Qualifications, and Advancement

In the past, almost all compositors were trained through some type of apprenticeship program. This has changed with the introduction of new technologies, which have lowered skill requirements. Today, most compositors bypass the traditional apprenticeship and learn the craft on the job.

Employers generally prefer to hire and train individuals who are already familiar with the industry. Some employers promote from within, selecting employees whose past performance indicates they could master the necessary skills. Formal graphic arts programs also provide an introduction to the industry. Courses are offered in vocational-technical institutes; industry-sponsored update and retraining programs; private trade and technical schools; and community and junior colleges. Four-year colleges offer graphic arts programs for those who may eventually move into management positions.

In an apprenticeship program, emphasis is placed on the operation of phototypesetting machines and in photocomposition work. Generally, apprenticeship covers a 4-year period of training, supplemented by classroom instruction or correspondence courses. However, this period may be shortened by as much as 2 to 2 1/2 years for apprentices who have had previous experience or schooling or who show the ability to learn the trade more rapidly.

Job applicants should be high school graduates, in good physical condition, and know how to type. Individuals interested in working for firms that utilize advanced printing technology need sufficient knowledge of electronics and computers to indicate an aptitude for mastering computerized photocomposition equipment. Manual dexterity and the ability to pay attention to detail and to work independently are important qualities for compositors who do layout work.

Persons with good typing skills can learn to be phototypesetting machine operators in a relatively short period of time. These workers need not be trained as skilled compositors, but they must be familiar with printing terms and measures. In recent years, many monotype and linotype operators have been retrained as phototypesetting operators.

Job Outlook

Employment of compositors and typesetters is expected to grow about as fast as the average for all occupations through the mid-1990's, largely mirroring growth trends in the printing industries. Technological developments will cause some composing room occupations to grow more rapidly than others, however. The number of photocomposition and phototypesetting jobs is expected to increase substantially as electronic composition replaces traditional composing and typesetting methods. Jobs that involve older methods and equipment will be phased out in many firms.

Up to this point, implementation of technologies such as typesetting computers, video display terminals (VDT's), and phototypesetting machines has had the greatest impact on newspapers. Computerized equipment has shifted much of the work away from traditional craft occupations to photocomposition occupations that require little more than competent keyboarding skills.

Newspaper employment is expected to grow as the industry expands, and newspapers will provide more new jobs for compositors and typesetters than any other sector of the printing industry. Individuals proficient in the newer photocomposition techniques will fill most of these jobs.

As the cost declines, applications of typesetting computers are taking hold in the commercial printing industry as well. Development of microprocessors, which reduce the size and cost of equipment, makes electronic composition accessible to the small firms that dominate the industry. As is the case in newspapers, expansion of the commercial printing industry is expected to offset the laborsaving effect of the new technologies, but composing and typesetting jobs with lower skill requirements will grow at the expense of traditional craft jobs.

The printing trade services industry will also benefit from the lower costs associated with electronic composition. This small industry sector will contribute to overall job growth because it employs a relatively large number of compositors and typesetters. Although most openings will be in the printing industry, some jobs for compositors and typesetters will be in other industries such as businesses that provide printing for direct mail advertisers.

Opportunities should be best for persons who have industry experience or have completed postsecondary programs in printing technology, such as those offered by community colleges and vocational-technical institutes. Many employers prefer to hire applicants who have completed these programs because the comprehensive training they receive helps them learn composing room trades and adapt to new processes and techniques more rapidly.

Earnings

Earnings of compositors and typesetters vary widely, reflecting differences in industry, skill level, and region of the country. Median annual earnings of full-time compositors and typesetters were about $15,700 in 1984; the middle 50 percent earned between $12,400 and $20,000 annually. Ten percent earned less than $9,900 and 10 percent more than $24,700.

The average wage rate for journeyman workers in the composing rooms of newspapers organized by the International Typographical Union was $11.42 an hour in 1985, according to a survey by the American Newspaper Publishers Association. Computer typists earn considerably less than journeyman composing room workers—45 to 50 percent of the journeyman rate, according to a limited number of union contracts.

Related Occupations

Other occupations in which workers operate machines equipped with keyboards include clerk-typists, computer terminal system operators, keypunch operators, and telegraphic-typewriter operators.

Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers such as newspapers and printing shops, the local office of the International Typographical Union, or the local office of the State employment service.

For general information on composing room occupations, write to:

Education Council of the Graphic Arts Industry, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22209.

International Typographical Union, P.O. Box 157, Colorado Springs, Col. 80901.

Graphic Communications International Union, 1900 L St. NW., Washington, D.C. 20036.

Dental Laboratory Technicians

(D.O.T. 712.281-010 and .381-014, -018, -022, -026 and -030)

Nature of the Work

Dental laboratory technicians are skilled craft workers who make and repair a wide variety of dental appliances, such as dentures, partial dentures, inlays, crowns, and orthodontic appliances. All work is done according to written prescriptions submitted by the dentist. Technicians make appliances from acrylics, ceramics, and metals. They use models of dental stone or plaster pourings made from impressions of a patient's teeth or mouth taken by the dentist. Sometimes these models are made by the dentist or an assistant, but most often by the technician.

Most technicians specialize. For example, a *dental ceramist* (D.O.T. 712.281-010) bonds dental porcelain over a metal framework to form porcelain crowns, bridges, and tooth facings; an *orthodontic technician* (D.O.T. 712.381-030) makes appliances for straightening teeth and treating speech impediments; and some technicians fabricate and repair full and partial dentures.

Trainees in beginning jobs usually mix and pour plaster into impression molds and perform other simple tasks. As they gain experience, they do more precise laboratory work such as arranging artificial teeth on dental appliances, working with dental ceramics (porcelain), or making castings of gold or chrome metal alloys. Technicians use small hand instruments such as wax spatulas and wax carvers, as well as special electric lathes and drills, high-heat furnaces, metal-melting torches, and other specialized laboratory equipment.

Working Conditions

Whether they are employed in independent commercial laboratories, dental offices, or in home laboratories, dental technicians work in typical laboratory surroundings. Work areas are generally clean, well lighted, and well ventilated. Technicians usually have their own workbenches which are equipped with Bunsen burners, grinding and polishing machines, and various handtools. Where many power tools are operating, noise levels may be considerable. The work is not strenuous, and although there may be pressure to meet schedules, dentists' deadlines usually are flexible enough to allow for any problems or special requirements that may be involved in completing a difficult job.

Salaried technicians usually work 40 hours a week but self-employed technicians frequently work longer hours.

Employment

Dental laboratory technicians held about 51,000 jobs in 1984. Most jobs were in commercial dental laboratories, which usually are small, privately owned businesses with fewer than 10 employees. However, a few laboratories are much larger, and employ over 200 technicians. Dental laboratories are located throughout the country, but mainly in large cities and populous States. Many laboratories receive work through the mail from dentists who work a considerable distance away.

About 9,000 dental laboratory technicians worked in dentists' offices. Others worked for hospitals that provide dental services and for the Federal Government, chiefly in Veterans Administration hospitals and clinics.

Approximately 1 technician in 5 is self-employed, a higher proportion than in most other occupations. Some of these jobs are held by technicians who "moonlight," doing work in home dental laboratories in addition to their regular job.

Precise work requires concentration.

Training, Other Qualifications, and Advancement

Most dental laboratory technicians learn their craft on the job, usually in 3 to 4 years. High school graduates are preferred, and courses in art, metal shop, and science are helpful. Many of those hired as trainees already have some knowledge of dental laboratory work, usually because they have taken courses or completed formal training programs.

Training in dental laboratory technology is available through community and junior colleges, vocational-technical institutes, and trade schools; high school vocational education programs; apprenticeships; and the Armed Forces. Formal training programs vary greatly both in length and the level of skill they impart. Accredited programs generally take 2 years to complete and lead to an associate degree, although some lead to a certificate or diploma.

In 1984, 58 programs in dental laboratory technology were approved (accredited) by the Commission on Dental Accreditation in conjunction with the American Dental Association (ADA). These programs provide classroom instruction in dental law and ethics, chemistry, ceramics, metallurgy, and related subjects. In addition, each student is given supervised practical experience in the school or an associated dental laboratory.

Students who have taken enough courses to learn the basics of the craft generally are considered by employers to be good candidates for training, regardless of whether they have completed the formal program. (Many students—vocational education students and apprentices in particular—drop out before completing the entire sequence of courses.) However, even graduates of 2-year training programs need about 3 additional years of practical experience to become fully qualified in the craft. Military personnel who receive dental laboratory training in the Armed Forces usually qualify for civilian jobs as dental laboratory technicians.

Certification, which is voluntary, is offered by the National Board for Certification in five specialty areas: Crown and bridge, ceramics, partial dentures, complete dentures, and orthodontics. Certification is increasingly important as evidence of a technician's competence.

Depending upon their skill, experience, and education, dental technicians may advance to supervisory or managerial positions. For some technicians, career advancement means moving into a related job within the dental field; well-qualified technicians may become instructors in dental lab training programs, or sales representatives for dental products companies. Still, for most technicians, advancement in this field means running one's own laboratory and enjoying the higher earnings that can accompany ownership.

Among the personal traits important in this occupation are a high degree of finger dexterity, good vision, and the ability to recognize very fine color shadings. These attributes must be combined with the ability to follow instructions and an inclination for detailed and absolutely accurate work. High school students interested in careers in this occupation are advised to take courses in art, crafts, metal shop, metallurgy, and sciences.

Job Outlook

Employment of dental laboratory technicians is expected to grow about as fast as the average for all occupations through the mid-1990's in response to rising incomes, population changes, and the growth of dental insurance plans. The population will include a larger proportion of elderly people, a group with a high level of need for the crowns, bridges, and dentures produced by dental laboratory technicians. The growing popularity of orthodontal work well beyond adolescent years may further heighten demand for dental laboratory services. Emphasis on orthodontic and cosmetic work may be spurred by dentists' marketing efforts, as competition among practitioners intensifies, not only for clientele, but for income-maximizing services.

Because dental laboratory technicians exhibit relatively strong attachment to the field, replacement needs are less important as a source of jobs than is the case for most other workers. However, some experienced workers leave dental laboratory technology each year to transfer to other occupations, and some retire.

Despite the trend toward corporate ownership of medical and dental laboratories, opportunities should be good for experienced technicians who wish to establish laboratories of their own. A technician whose work has become known to several dentists in a community will have the best prospects of building a successful business.

Earnings

Dental laboratory technicians who worked full time in commercial laboratories earned about $333 a week in 1984, according to the limited data available. Generally, education and experience, along with a specialized skill, bring higher earnings. For example, technicians who specialize in ceramics receive much higher salaries than those who specialize in contour wire framing. Large dental laboratories employ supervisors or managers, who usually earn more than technicians. In general, earnings of self-employed technicians exceed those of salaried workers.

In the Federal Government, graduates of ADA-approved programs with no experience were paid starting salaries of about $12,900 in 1985. Experienced dental laboratory technicians employed in the Federal Government had average earnings of about $21,300 in 1984.

Many technicians in commercial laboratories receive paid holidays and vacations and some also receive paid sick leave, bonuses, and other fringe benefits. Technicians employed by the Federal Government have the same benefits as other Federal employees.

Related Occupations

Dental laboratory technicians make artificial teeth, crowns and inlays, and orthodontic appliances following the specifications and instructions provided by the dentist. Other workers who make medical devices include arch-support technicians, orthotics technicians (braces and surgical supports), prosthetics technicians (artificial limbs and appliances), opticians, and ophthalmic laboratory technicians.

Sources of Additional Information

For information about training and a list of approved schools, contact:

American Dental Association, Council on Dental Education, Division of Educational Measurement, 211 E. Chicago Ave., Chicago, Ill. 60611.

Information on scholarships is available from dental technology schools or from the American Fund for Dental Health, 211 E. Chicago Ave., Chicago, Ill. 60611.

For information on career opportunities in commercial laboratories and requirements for certification, contact:

National Association of Dental Laboratories, 3801 Mt. Vernon Ave., Alexandria, Va. 22305.

Jewelers

(D.O.T. 700.281-010, -014, -022, and .381-030, -042, and -046)

Nature of the Work

For thousands of years, people have worn and admired jewelry made from precious metals and stones, such as gold and diamonds. Jewelers use such materials to make and repair rings, necklaces, bracelets, earrings, and other jewelry.

Jewelers who work in jewelry stores and repair shops generally provide a variety of services to their customers. Much of their time is spent repairing jewelry. Typical repair jobs are enlarging or reducing rings, resetting stones, and replacing broken clasps and mountings. Some jewelers also may design jewelry by hand, repair watches, and do hand engraving. A small number are qualified gemologists, who appraise the quality and value of diamonds and other gemstones.

Those who own stores or shops hire and train employees, order and sell merchandise, and handle other managerial duties.

Jewelers who work in manufacturing generally only do one specialized job. For example, some make molds to cast jewelry or dies to stamp it. Others do finishing work, such as setting stones or engraving. However, a small number of the most highly skilled jewelers make entire jewelry pieces. Following their own designs or those created by designers, they shape the metal with pliers or other handtools or cast it in molds. They then solder individual parts to form the finished piece. They may carve designs in metal, and mount diamonds or other stones. A growing number of jewelers use lasers to engrave letters and designs into gold, silver, or other metals.

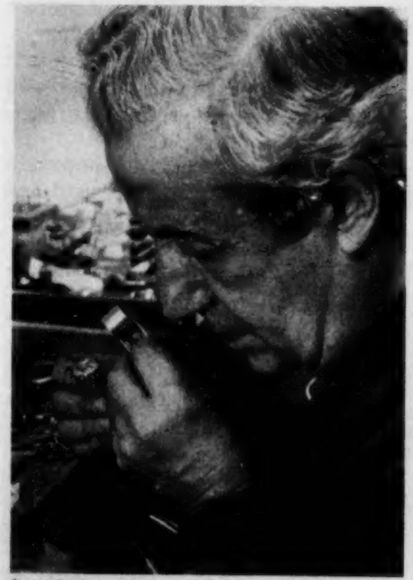
Jewelers use pliers, files, saws, hammers, torches, soldering irons, and a variety of other small handtools. They use chemicals and polishing compounds, such as jeweler's rouge, for soldering or finishing. Because the work is very detailed, jewelers often wear magnifying glasses.

Working Conditions

Jewelers usually work in comfortable surroundings, and the trade involves few physical hazards. However, doing delicate work while trying to satisfy demands for speed and quality from customers and employers can cause some stress.

In stores and repair shops, jewelers generally work alone with little supervision. However, in retail stores they may talk with customers about repairs and even do some sales work.

In some precious jewelry manufacturing plants, the workweek is 35 hours. Most jewelers in stores and repair shops work 40 to 48 hours a week including evenings and Saturday. During peak sales seasons, such as Christmas, they often work longer hours, but are compensated for overtime. However, during slack periods, they may face layoff or a shortened workweek.



Jewelers use loupes to appraise diamonds.

Employment

Jewelers held about 32,000 jobs in 1984. About forty percent of all jewelers are self-employed, operating jewelry stores or repair shops.

Many jewelers employed in precious jewelry manufacturing work in New York City. Although jewelry stores and repair shops are located throughout the country, most jobs in these establishments are in metropolitan areas.

Training, Other Qualifications, and Advancement

Jewelers' skills usually are learned through training on the job or in technical schools.

Technical school programs are the major source of training for people who want jobs in jewelry stores or repair shops. In these programs, which vary in length from 6 months to 3 years, students learn the use and care of jewelers' tools and machines and basic jewelers' skills, such as casting, stone setting, polishing, and design. Some of these courses are very technical and cover topics like blueprint reading, math, and shop theory. Store and shop owners prefer graduates of these programs over people with no experience in the trade. However, most employers feel that graduates need an additional 3 years or more of supervised on-the-job training to refine their repair skills and to learn more about the operation of the store or shop. In addition, short-term courses such as sample making, wax carving, and gemology are available at some technical schools to help workers develop their skills.

In jewelry manufacturing plants, workers traditionally have developed their skills through informal on-the-job training programs provided by their employer. This training could last for 3 to 4 years, depending on the difficulty of the skill. Training usually focuses on a particular specialty—casting, stone setting, or engraving. A growing number of technical schools now offer training designed for jewelers working in manufacturing. Employers generally prefer graduates of programs because they already know the basics of the trade and the in-house training programs can be shortened significantly.

A high school education has become very important for people entering the trade. A growing number of technical schools require a high school diploma or its equivalent for admission. Courses in art, math, mechanical drawing, and chemistry are useful, depending on which aspect of the trade one chooses to follow.

The precise and delicate nature of jewelry work requires finger and hand dexterity, good eye-hand coordination, patience, and concentration. Artistic ability is a major asset, because jewelry must be stylish and attractive. Jewelers in retail stores should be neat, personable, and dependable in order to keep satisfied customers.

In manufacturing, jewelers sometimes advance to supervisory jobs; however, advancement opportunities generally are limited. Jewelers who work in jewelry stores or repair shops may become salaried managers of jewelry stores; some open their own businesses.

A substantial financial investment is required to operate a jewelry store, because an inventory of expensive merchandise must be obtained. The jewelry business also is highly competitive. Therefore, jewelers who plan to open their own stores should have experience in selling and business management. Technical school courses in jewelry retailing and jewelry store management also are helpful.

Job Outlook

Employment of jewelers is expected to increase more slowly than the average for all occupations through the mid-1990's. Demand for jewelry repair will increase as the stock of jewelry continues to rise. Maintaining and repairing this jewelry will create job opportunities for jewelry repairers. Additional job openings will result from the need to replace experienced jewelers who transfer to other occupations, retire, or leave the labor force for other reasons. Overall, the job outlook will be best in jewelry stores and repair shops.

Job opportunities for jewelers in manufacturing depend on jewelry sales. Increasing foreign competition and factory automation have caused employment growth to slow. In addition, inflation and recession force people to spend less on luxuries such as jewelry, so that job opportunities in jewelry factories may fluctuate with economic conditions.

Busy store and shop owners often are reluctant to hire untrained and inexperienced workers. People entering the trade may have trouble finding a job unless they can demonstrate their ability. Such persons can improve their chances for employment by attending a technical school with a good reputation among local store or shop owners.

Earnings

Median weekly earnings of full-time jewelers were about $290 in 1984. The middle 50 percent earned between $225 and $390. The bottom 10 percent earned less than $130, and the top 10 percent earned more than $550. Earnings of experienced, unionized jewelry workers in manufacturing ranged from about $8.50 to $10.50 an hour, according to the limited information available. New workers in jewelry factories received about $5 an hour to start. New workers receive periodic raises up to the minimum union wage for their job.

Related Occupations

Jewelers are important craft workers in the jewelry industry. Other skilled workers in this industry include gem cutters, gemologists, hand engravers, model makers, and watch repairers.

Sources of Additional Information

For information on job opportunities in jewelry stores as well as information on training programs, contact:

Jewelers of America, Time-Life Building, Suite 650, 1271 Avenue of the Americas, New York, N.Y. 10020.

Lithographic and Photoengraving Workers

(D.O.T. 652.665-014, .685-022 and -086; 970.361-014, .381-030; 971.261, .381 except -042, -046 and -058, .382, .685; 972.281; .282-010 and -014, .381 except -018; .382; 979.381-018 and -022, .382-022, .682-014)

Nature of the Work

Lithography, also called offset printing, is the dominant method of printing. In this process, lithographers photograph or scan the material to be printed and make a printing plate from the film which, when inked, is pressed against a rubber-covered roller to transfer the ink onto the paper. In photoengraving, a similar process, photoengravers produce metal plates or gravure cylinders for reproduction of copy. Although lithography is replacing photoengraving in many of its applications, photoengraving is still being used.

Lithographic and photoengraving workers are responsible for a variety of printing activities ranging from photographing copy and pictures to making the final printing plates. In small shops, a single worker may handle every step in the printing process. Otherwise, lithographic workers in particular tend to specialize, and have job titles such as camera operator, artist, stripper, or platemaker.

Camera operators start the process of making a lithographic plate by photographing and developing negatives of the material. Much of the camera work can be done electronically. These workers generally are classified as line camera operators, halftone operators, or color separation photographers.

Scanner operators create film negatives of photographs or art with the aid of computerized equipment. A photograph, for instance, is scanned, sometimes by laser beam, to reproduce an image on film in the form of a series of dots. The computer controls the scanning process, which can be programmed to correct for mistakes or deficiencies in the original.

Negatives may need retouching. *Lithographic artists* take care of this by sharpening or reshaping images on the negatives. They do the work by hand, using chemicals, dyes, and special tools. Lithographic artists must know the characteristics of all types of paper and must produce fine shades of color. Like camera operators, they are usually assigned to only one phase of the work, and may have job titles such as dot etchers, retouchers, or letterers.

Strippers cut the film to required size and arrange and paste the negatives onto layout sheets, which are used by platemakers to make press plates. In large printing establishments like newspapers, arrangement is done automatically. *Platemakers* cover the surface of flat pieces of metal with a coating of photosensitive chemicals, or may use plates with the coating already applied. They then put the layout sheet on top of the plate and expose both to bright lights. As the final step, platemakers treat the plate with chemicals to bring out the images of the material to be printed. In a growing number of printing plants, lithographic platemakers use machines which automatically process the plates. Such equipment requires technical skills, primarily. The platemaker operates and maintains the machine and insures that plates meet quality standards. When a large number of plates or multiple images are needed, operators use a step-and-repeat machine.

Working Conditions

Although lithographic and photoengraving workers stand most of the time, the work is not physically demanding. Lithographic artists and strippers may find working with fine detail tiring and fatiguing to the eyes. Platemakers in both processes working with toxic chemicals may be exposed to skin irritations. Work areas usually are well lighted and air-conditioned.

Lithographic and photoengraving workers generally work a regular 8-hour day but sometimes have to work overtime to meet publication deadlines. Some workers—particularly those employed by newspapers—work night shifts, weekends, and holidays.

Employment

Lithographic and photoengraving workers held 75,000 jobs in 1984. Employment was distributed as follows:

Lithographic and photoengraving workers, precision	45,300
Lithographic and photoengraving photographers	20,200
Lithographic and photoengraving machine operators and tenders	9,100

Most jobs are in small commercial printing plants, newspapers, and printing trade service firms.

Although these workers are located in all parts of the country, most are employed in large printing centers such as New York, Chicago, Los Angeles, Philadelphia, Washington, D.C., and Dallas.

Training, Other Qualifications and Advancement

Most lithographic and photoengraving workers learn the trade through on-the-job training. They work as helpers and are taught by experienced craft workers. Years of on-the-job training are required in order to become a skilled worker.

Apprenticeship provides another way of becoming a skilled worker, although few apprenticeships have been offered in recent years. Apprenticeship programs may emphasize a specific craft, such as camera operator or lithographic artist, etcher, finisher, or proofer, but the apprentice is introduced to all phases of the operation.

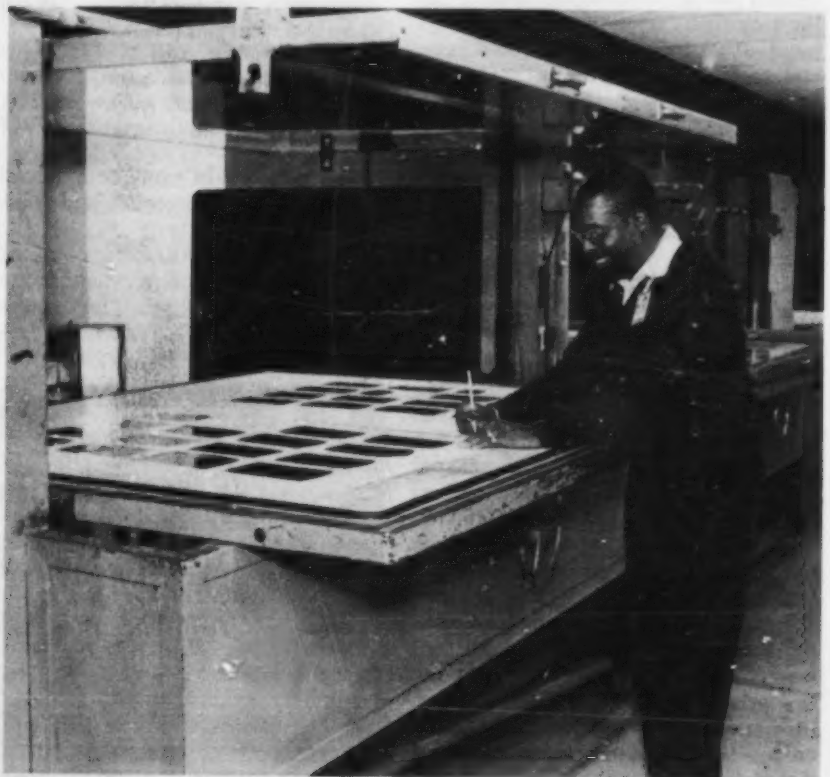
Usually, applicants for training must be high school graduates, at least 18 years of age, and in good physical condition. A knowledge of color composition is an asset, as is evidence of an aptitude for mastering the computer-assisted equipment used in graphic preparatory processes. Camera operators should have an understanding of chemistry, optics, and the entire offset and photographic process. Precision, patience, good eyesight, and artistic skills are important qualifications for lithographic artists and strippers.

Vocational-technical institutes, community and junior colleges, and 4-year colleges offer 2-year programs in printing technology which provide a valuable background for persons interested in learning lithographic crafts. High school and vocational school training in printing, photography, mathematics, chemistry, physics, mechanical drawing, and art also is helpful.

Job Outlook

Employment of lithographic workers is expected to grow about as fast as the average for all occupations through the mid-1990's, but employment of photoengraving workers is expected to decline. These divergent trends reflect the fact that offset printing methods—which involve lithography—are replacing letterpress printing, which requires photoengraving skills. Also contributing to the continued employment growth projected for lithographic workers is the trend toward greatly increased use of color in print materials, such as newspaper advertising inserts and mail-order catalogs. Most openings, however, will result from the need to replace experienced workers who leave the occupation.

New labor-saving technologies are on the horizon. A reduction in the number of steps required to make a plate is already affecting platemakers' jobs, and electronic scanners that automatically separate colors are likely to reduce demand for camera operators as the cost of the equipment falls. Electronic pagination will eventually displace strippers. These technologies are expensive, however, and widescale use in an industry dominated by small firms may not occur until the late 1990's or after.



Lithographers must pay close attention to detail.

Employment opportunities should be best for people who have completed postsecondary programs in printing technology. Many employers prefer to hire applicants who have completed these programs because the comprehensive training they receive helps them learn lithography and adapt more rapidly to new processes and techniques.

Earnings

The basic wage rate for a lithographic or photoengraving worker depends on the job and location. Average hourly wage rates for photoengravers were $15.30 in 1984, according to the Graphic Communications International Union. Lithographers operating a scanner earned $17.39 an hour in 1984.

Related Occupations

Lithographic and photoengraving workers use artistic skills in their work. Artistic skills are also essential for sign painters, jewelers, decorators, and engravers.

Sources of Additional Information

Details on apprenticeship and other training opportunities in lithography and photoengraving are available from local employers such as newspapers and printing shops, local offices of the Graphic Communications International Union, or the local office of the State employment service. For information on schools that offer courses in printing technology, write to:

Education Council of the Graphic Arts Industry, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

For general information on lithographic occupations, write to:

Graphic Communications International Union, 1900 L St. NW., Washington, D.C. 20036.

Machinists

(D.O.T. 600.260-018, .280-022, -026, -030, -034, -038, -042, .281-010, .380-010; 693.281-026; and 714.281-018)

Nature of the Work

Machinists are skilled workers who make precision metal parts for industrial machinery, instruments, aircraft, and other goods. Their skills are very important in the production of goods that are made in numbers too small to produce with automated machinery. They can set up and operate most types of machine tools. They also know the working properties of metals such as steel, cast iron, aluminum, and brass used to make these goods. Using this knowledge of metals plus their skill with machine tools, machinists plan and carry out the operations needed to make machined products that meet precise specifications.

Machinists first review blueprints or written specifications for a job. Next, they select tools and materials for the job and plan the sequence of cutting and finishing operations. They also must calculate where to cut or bore into the workpiece, how fast to feed the metal into the machine, and how much metal to remove. They then mark the metal stock to show where these cuts should be made.

After this layout work is completed, they perform the necessary machining operation. Machinists position the metal stock on the machine tool, set the controls, and make the cuts. They use precision instruments, such as micrometers, to make sure their work meets specifications. After completing the machining operations, machinists finish and assemble the pieces.

Some machinists do maintenance work, repairing or making new parts for machinery. They also adjust and test these parts.

Working Conditions

Most machine shops are well lighted and well ventilated. Working around high-speed machine tools, however, presents certain dangers, and workers must follow safety practices. Machinists must wear protective equipment such as safety glasses to shield against bits of flying metal and earplugs to protect against the noise from machinery. They cannot wear jewelry or loose-fitting clothes that might get caught in the machine. The job requires stamina because machinists stand most of the day and may lift moderately heavy workpieces. In some shops, machinists may have to work evening or night shifts.

Employment

Machinists held about 354,000 jobs in 1984. Most work in industries that manufacture industrial machinery, fabricated metal products, motor vehicles, aircraft, and primary metals. The Federal Government also employs machinists in Navy yards and other installations.

Although machinists work in all parts of the country, jobs are most plentiful in metropolitan areas where most factories are located.

Training, Other Qualifications, and Advancement

A 4-year formal apprenticeship is the best way to learn the machinist trade. Some machinists learn the trade informally on the job, however. Typical machinist apprentice programs consist of shop training and related classroom instruction. In shop training, apprentices learn chipping, filing, handtapping, dowel fitting, riveting, and the operation of various machine tools. In the classroom, they study blueprint reading, mechanical drawing, shop mathematics, and shop practices. Nonapprentice training consists of similar but less structured on-the-job training without any classroom instruction.

Persons interested in becoming machinists should be mechanically inclined in order to use the tools and machines required to build complex parts. They also should be temperamentally suited to do highly accurate work that requires concentration as well as physical effort. Prospective machinists should be able to work independently.

A high school or vocational school education, including mathematics, blueprint reading, metalworking, physics, and drafting is desirable. A basic knowledge of computers and electronics is helpful because of the increased use of computer-controlled machine tools. Experience with machine tools also is helpful. In fact, many of the people who enter the occupation have previously worked as machine-tool operators or setters.

Some companies have experienced machinists take additional courses in mathematics and electronics at company expense in order to learn to use newer metalworking technologies, such as numerically controlled machine tools. In addition, equipment manufacturers generally provide training in the operation of new machine tools.

Machinists may become supervisors. Others take additional training and become tool-and-die or instrument makers. Skilled machinists may

Working in machine shops can be dangerous, and machinists must wear protective equipment.

open their own shops or advance into other technical jobs such as tool programmer.

Job Outlook

Employment of machinists is expected to increase more slowly than the average for all occupations through the mid-1990's. Many openings will arise from the need to replace experienced machinists who transfer to other fields of work, retire, or die. Although the proportion of machinists who leave the occupation each year is somewhat lower than that for all craft workers, replacement needs will account for most job openings.

As the economy expands, so will the demand for goods that have machined metal parts. While this growth in demand will increase the need for machinists, employment growth will be limited by the growing substitution of nonmetal parts in many products, increasing foreign competition, and improvements to metalworking technology. Chief among these improvements is the use of computer-controlled machine tools that significantly reduce the time for machining operations.

As industries continue to use a greater volume of complex machinery and equipment, however, proper maintenance will become increasingly important, and more skilled maintenance machinists will be needed to prevent costly breakdowns in highly mechanized plants. Often the breakdown of just one machine can stop an entire production line for hours.

Employment of machinists fluctuates with economic conditions. When demand for machined goods falls, machinists involved in production may be laid off or be forced to work fewer hours. In areas where demand for machined goods rises sharply, temporary shortages of skilled machinists may develop. Employment of machinists involved in plant maintenance is more stable because proper maintenance and repair of costly equipment remain vital concerns even when production levels fall.

Earnings

In 1984, median weekly earnings for machinists were about $395. Most earned between $304 and $495. Ten percent of all machinists had median weekly earnings of less than $230, while the 10 percent with the highest earnings made more than $595 a week.

The earnings of machinists compare favorably with those of other skilled workers. Machinists employed in metropolitan areas had estimated average hourly earnings of $12.45 in 1984. In comparison, the average hourly rate for all production workers in private industry, except farming, was $8.33.

Average hourly rates in 10 areas, selected to show how rates differ in various parts of the country, appear in the accompanying table. Machinists also have numerous opportunities for overtime work when demand for machined parts is high.

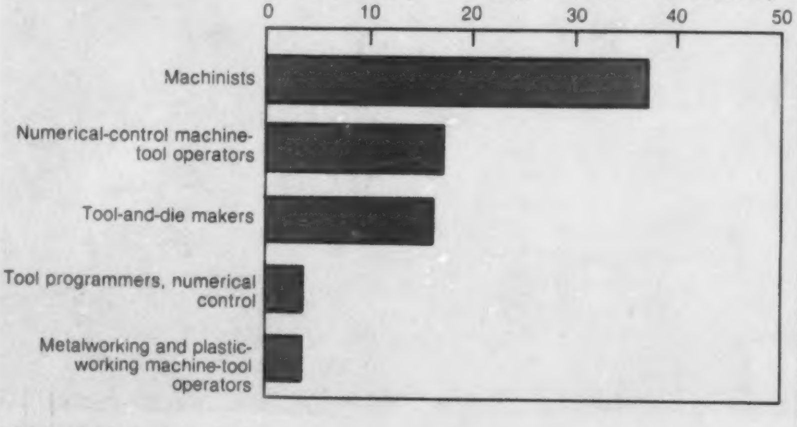
Table 1. Average hourly earnings of machinists, selected areas, 1984

Area	Hourly rate
San Francisco-Oakland	$14.84
Milwaukee	14.70
Corpus Christi	14.35
Portland, Oregon	13.84
Atlanta	13.79
Gary-Hammond-East Chicago	12.91
Trenton	10.25
Jackson	10.18
Norfolk-Virginia Beach	10.05
Northeast Pennsylvania	9.87
Providence-Warwick-Pawtucket	9.43
Greenville-Spartanburg	8.83

SOURCE: Bureau of Labor Statistics.

Many machinists are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; and the United Steelworkers of America.

More new jobs are expected for machinists than for other machining occupations.



SOURCE: Bureau of Labor Statistics

Related Occupations

Occupations most closely related to machinists are, of course, the other machining occupations. These include tool-and-die makers, metalworking machine operators, tool programmers, and instrument makers. Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, gunsmiths, locksmiths, metal patternmakers, and welders.

Sources of Additional Information

For information about machinist apprenticeships or other work opportunities in this trade, contact local machine shops, a local of one of the unions mentioned above, or the nearest office of the State employment service or State apprenticeship agency.

For general information about this occupation, contact:

The National Machine Tool Builders, 7901 Westpark Dr., McLean, Va. 22102.

The National Tooling and Machining Association, 9300 Livingston Rd., Ft. Washington, Md. 20744.

The National Screw Machine Products Association, 6700 W. Snowville Rd., Breckville, Ohio 44141.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068.

Photographic Process Workers

(D.O.T. 962.361-010; 970.281-010 and -018; .381-010 and -034; 976.361, .380, .381-010 through .385-010, .665-010, .681, .682, .684-014, .685-014, -018, -022, -026, and -030)

Nature of the Work

If the developing of film and printing of pictures were left to the average photographer, few photographs would be taken. Instead, professionals and amateurs alike generally rely on photographic process workers in photofinishing or custom photo labs to develop film, make prints and slides, and do related tasks such as enlarging and retouching photographs. Some photographic process workers operate machinery that automatically develops and prints film; others do detailed tasks that cannot be automated.

All-round darkroom technicians can do everything necessary to develop and print film. They vary the developing process according to the type of film—black-and-white negative, color negative, or color positive. For example, a developing process for black-and-white negative film covers five steps: Developer, stop bath, fixing bath, washing, and drying. The first three steps use chemical solutions and are performed in darkness. In a hand operation, the technician first immerses unwound film in the developer to bring out the image on exposed film. After a specified period, the technician transfers the film to a stop bath to prevent overdevelopment. Next, the film is placed in a fixing bath that makes it insensitive to light to prevent further exposure. Finally, the technician washes the film with water to remove the fixing solution and places the film in a drying cabinet. Although processing still is done by hand in some small photographic studios, technicians in most photographic labs operate machines that automatically perform the steps described above.

The darkroom technician makes a photograph by transferring the image from a negative to photographic paper. Printing frequently is performed on a projection printer, which consists of a fixture for holding negatives and photographic paper, an electric lamp, and a magnifying lens. The technician places the negative between the lamp and lens, and the paper below the lens. When the technician turns on the lamp, light passes through the negative and lens and records a magnified image of the negative on the paper. During printing, the technician may vary the contrast of the image or remove unwanted background by either using paper patterns to shade part of the photographic paper from the projected image or by adjusting the height of the lens above the paper. After removing the exposed photographic paper from the printer, the technician develops it in much the same way as the negative. If the customer desires, the technician mounts the finished print in a frame or on a paper or cardboard back.

Some darkroom technicians specialize in one aspect of photographic processing work. For example, *airbrush artists* restore damaged and faded photographs. They also color drawings to simulate photographs. *Photographic retouchers* alter photographic negatives and prints to accentuate the desired features of a subject or remove undesirable ones. *Colorists* apply oil colors to portrait photographs to create a natural, lifelike appearance. *Photographic spotters* cover or spot out imperfections on photographic prints using a gloved finger, brush, or pencil. *Color laboratory technicians* produce color prints, negatives, and slides by hand.

In addition to working in the laboratory, darkroom technicians may set up lights and cameras or otherwise assist experienced photographers. Many technicians, particularly those in portrait studios who aspire to become professional photographers, divide their time between taking and processing pictures. In some labs, helpers assist technicians. Technicians also may be assisted by photographic process machine operators who specialize in a particular activity.

In most large photo labs where film developing is largely automated, darkroom technicians supervise operators whose assignments require only a limited knowledge of developing and printing. Included are *film developers*, who operate equipment that develops still or motion picture film automatically; *color-printer operators*, who control the equipment used to produce color prints from negatives; *automatic print developers*, who operate machines that develop rolls of exposed photographic paper; *takedown sorters*, who sort processed film; and *automatic mounters*, who tend the automatic mounting presses that cut film into individual transparencies and seal them in mounting frames.

Working Conditions

Photo lab jobs are not physically strenuous, and the work is done in clean, appropriately lighted, and air-conditioned photofinishing laboratories. However, many workers, especially in large laboratories, do repetitious work at a rapid pace. Some photographic process workers are exposed to fumes from the chemicals used to develop film. Workers such as airbrush artists and photographic spotters, who perform detailed tasks, may be subject to eye fatigue.

Most photo lab employees work a 40-hour week. In labs that specialize in processing film for amateur photographers, employees may work a considerable amount of overtime, at premium pay, during peak seasons such as summer and after Christmas.

Employment

Photo process workers held about 52,000 jobs in 1984. About half worked in large photofinishing labs that process film for amateur and professional photographers and in minilabs that process film at the customer's convenience. Many others worked in photo labs operated by portrait and commercial studios and with motion picture producers, photo equipment manufacturers, and other organizations. Darkroom technicians also work in commercial labs that specialize in processing the work of professional photographers.

Precise instruments are used to capture a perfect image on paper.

Photo process workers are employed in all parts of the country but are concentrated in large population centers.

About 3 out of 10 entrants to this occupation work part time.

Training, Other Qualifications, and Advancement

Most photo process workers learn their skills through informal on-the-job training. Beginners start as helpers and gradually learn to develop and print film by assisting experienced technicians. It generally takes 2 to 3 years to become a fully qualified darkroom technician. Some helpers specialize in a particular activity, such as printing or developing. Generally, less training time is required to become a specialist than to become an all-round darkroom technician.

When hiring darkroom technician helpers, employers prefer applicants who are high school graduates. Courses in chemistry and mathematics are helpful to people interested in this field. Some high schools and trade schools offer courses in photography that include training in film processing. The Armed Forces also offer training in photographic processing. Experience gained through processing film as a hobby is helpful.

Several community colleges offer 2-year programs leading to an associate degree in photographic technology. Formal training also is available from vocational schools and technical institutes. Completion of postsecondary courses in this field is helpful to people who are interested in supervisory and managerial jobs in photo labs.

Some darkroom technicians eventually become professional photographers. (See the statement on photographers and camera operators elsewhere in the *Handbook*.) Others advance to supervisory positions in laboratories.

On-the-job training for workers in specialized photo process occupations ranges from a few weeks for print developers and automatic mounters, for example, to several months for photo retouchers and spotters. For many jobs, manual dexterity, good vision, including normal color perception, and good hand-eye coordination are important qualifications.

Job Outlook

Employment of photo process workers is expected to increase faster than the average for all occupations through the mid-1990's. Growth in the number of small photofinishing laboratories will create many new jobs. Most openings, nevertheless, will result from replacement needs. Job prospects for photo process workers are associated to some extent with fluctuations in the business cycle; these workers are subject to layoff during economic downturns and during certain seasons of the year when the volume of film processing declines.

The demand for film processing is expected to rise as a result of the expanding interest in amateur photography—spurred by rising population and personal income as well as improvements in still and movie cameras that make them easier to load and operate. Businesses and government also are expected to contribute to the demand for film processing through expanded use of photography in research and development activities and increased use of photographs to illustrate printed materials. Employment of photographic process workers is not expected to keep pace with the demand for film processing, however, because of the continuing automation of photo lab operations.

The most recent technical advance is Dx processing, which allows photofinishing equipment to process film without sorting it by film speed. The increased use of video discs, which do not need to be processed, also will slow employment growth for photographic process workers.

Earnings

Earnings of photo process workers vary greatly depending on skill level, experience, and geographic location. Median earnings for full-time photo process workers in 1984 were about $250 a week. The middle 50 percent earned between about $190 and $360 a week. The lowest 10 percent earned less than $150 a week; the highest 10 percent, more than $500.

Related Occupations

The more highly skilled photo process workers—all-round darkroom technicians and color laboratory technicians, for example—need a specialized knowledge of the photodeveloping process. Other laboratory workers who apply specialized technical knowledge include chemical laboratory technicians, crime lab analysts, food testers, medical laboratory assistants, metallurgical technicians, and quality control technicians.

Sources of Additional Information

For information about employment opportunities in photographic laboratories and schools that offer degrees in photographic technology, write to:

Photo Marketing Association International,
3000 Picture Place, Jackson, Mich. 49201.

Shoe and Leather Workers and Repairers

(D.O.T. 365.361; 780.381-030; 781.381-018; 783.361-010; 783.381-018 through 026; 788.261-010; 788.381)

Nature of the Work

At one time, leather and leather products were reserved for royalty. Today, people from all walks of life appreciate and value leather products. Among the many products produced from leather are shoes, jackets, boots, saddles, and luggage. Creating stylish and durable leather products is the job of precision shoe and leather workers; keeping them in good condition is the work of repairers.

Among the workers involved in making custom orthopedic shoes, saddles, harnesses, and luggage are shoemakers, saddlemakers, and harnessmakers, to name a few. Job duties of these workers are similar, even though the finished products differ.

Depending on the size of the factory or shop, a leather worker may perform one or many of the steps that it takes to complete the product. First, the worker checks the leather for texture, color, and strength. Then the worker places a pattern of the good being produced on the leather, traces the pattern onto the leather, cuts the pattern along the traced lines, and sews the pieces together. In very small factories, one worker may perform all of these tasks. More commonly, however, workers specialize in different steps. At times, they may move from one task to another in order to learn and master different skills in the production of the leather good.

In the production of custom-made shoes, workers must first make the pattern. Then they cut the leather and sew the pieces together either by hand or with a sewing machine. The worker then attaches the insole, heel, and outsole, using nails and cement. The heel is shaped with a knife and sanded for smoothness on a buffing wheel. Finally, the worker dyes the shoe, and polishes it by holding it against a rotating brush.

Producing a saddle entails applying paints and liquids to produce gloss, and decorating the saddle surface either by hand stitching or stamping the leather with decorative patterns and design.

Shoe and leather repairers use their knowledge of leatherworking and shoe construction to give worn shoes and other leather goods a new lease on life. The most common type of shoe repair is replacing soles and heels. Repairers place the shoe on a last (a block shaped like a foot) and remove the old sole and heel with a knife. New soles and heels are attached to the shoe either by stitching them in place or using cement or nails. Repairers then sand the heel to smooth it, using a sanding or buffing wheel.

Leather workers and repairers use handtools and machines. The most commonly used handtools are knives, hammers, awls (used to poke holes in leather to make sewing possible), and skivers (for splitting leather). Power-operated equipment includes sewing machines, heel nailing machines, hole punching machines, and sole stitchers.

Self-employed shoe repairers and owners of custom-made shoe and leather shops have managerial responsibilities in addition to their regular duties. They must maintain good relations with their customers, make business decisions, and keep accurate records.

Working Conditions

Working conditions of leather workers vary according to the type of work performed, the size of the factory or business, and the particular place of employment.

Workers employed in relatively large custom leather goods manufacturing establishments (20 employees or more) work in large rooms. Repairers generally work in smaller rooms. Depending on the establishment, the room may be crowded and noisy and have poor lighting and ventilation. Some establishments may be well lighted and ventilated, but, because machines are used both in preparing and repairing leather, the work environment is generally noisy. Odors from leather dyes and stains are often present. The work is not strenuous and hazards are few if safety precautions are followed. However, stamina is needed because leather workers and repairers must stand much of the time.

Custom shoe manufacturing workers and shoe repairers may work more than 40 hours a week. Workers in other areas of the leather industry, however, average about 38 hours a week.

Employment

Shoe and leather workers and repairers held approximately 43,000 jobs in 1984. Self-employed individuals, who own small shoe repair or specialty leather manufacturing firms, held about 12,000 of these jobs. The rest were employed in the manufacture of leather goods, especially shoes. Other areas of employment include large shops doing shoe and leather repair and repair shops operated by shoe stores, department stores, and drycleaning establishments.

Training, Other Qualifications, and Advancement

Precision shoe and leather workers and repairers generally learn their craft on the job, either in in-house training programs or working as helpers to experienced workers. Helpers generally begin by performing the simplest tasks, either in the creation or repair of a leather good. As the helper gains experience, the experienced worker allows the trainee to perform more difficult steps such as sewing, cutting, or stitching the leather. Trainees generally become fully skilled in 6 months to 2 years; the length of training varies greatly according to the aptitude and dedication of the individual and the nature of the work (manufacture or repair).

In 1984, only about 18 schools nationwide offered programs in shoe repair and leather work, including saddlemaking. Vocational training lasts from 6 months to 2 years and is offered at high schools, trade schools, community colleges, and at least one university. In vocational classes, students learn a number of different skills including leather cutting, stitching, and dying. Students learn shoe construction and practice different types of shoe repair. They also study fundamental business practices. Graduates are encouraged to gain additional training by working with an experienced leather worker or repairer.

Many shoe repairers own their own shops.

Manual dexterity and the mechanical aptitude to work with handtools and machines are important in the shoe repair and leatherworking occupations. Shoe and leather workers who produce custom-made goods should have artistic ability as well. These workers must have self-discipline to work alone under little supervision. In addition to being skilled craft workers, leather workers and repairers who own shops must have a pleasant manner when dealing with customers and a working knowledge of business practices and management.

Many individuals who begin as workers or repairers advance to managerial and supervisory positions, eventually even becoming the owner of a shop or business.

Job Outlook

Employment of shoe and leather workers is expected to decline through the mid-1990's in line with anticipated trends in the leather footwear industry, which has been hit hard by imports of inexpensive leather shoes. The popularity of nonleather athletic and casual shoes has also lowered demand for manufactured leather goods.

Prospects for workers employed in

the manufacture of custom-made molded or orthopedic shoes are better than those for most other leather workers. Substantial growth is expected for the population age 65 and above, the age group most likely to suffer from podiatric problems that require molded or orthopedic shoes. Production jobs in this small specialty sector, therefore, are likely to remain stable.

Employment of shoe repairers is likely to decline. This occupation is subject to a number of conflicting forces, but the overall employment trend is down. Stimulating demand for shoe repair services is the introduction of "while-you-wait" repair shops which cater to consumer desire for convenience. On the other hand, the widespread availability of low-cost shoes and the increase in cushion-soled footwear that is not practical to repair will dampen demand. The latter forces are likely to dominate, so that employment of shoe repairers will fall.

A limited number of job openings can be expected, however, due to the need to replace experienced workers who transfer to other occupations, retire, or leave the field for other reasons.

In custom shoe manufacturing and shoe repair, prospects are expected to be good for people with some knowledge of the trade or a demonstrated aptitude for mastering the requisite skills. Once trained, workers are likely to find employment with relatively little difficulty since there is little competition for these relatively low-paying jobs. Workers employed in areas other than custom shoe manufacture or repair may find job opportunities scarce.

Earnings

The median weekly salary of shoe and leather workers and repairers was $250 in 1984, according to the limited information available. Workers in custom shoe manufacturing may earn up to $400 a week in some establishments. The top 10 percent of all shoe and leather workers and repairers earned over $349 a week. Owners of shoe repair and custom shoe manufacturing shops earned substantially more.

Related Occupations

Other workers who make or repair items using handtools and machinery include dressmakers, designers and patternmakers, rug repairers, and furriers.

Sources of Additional Information

For information about employment in leatherworking, contact:

Leather Industries of America, 2501 M St. NW., Suite 350, Washington, D.C. 20037.

For information about the shoe repair business and training opportunities in leather work and shoe repair, contact:

Shoe Service Institute of America, 154 West Hubbard St., Suite 303, Chicago, Ill. 60610.

Information about employment and training opportunities is available from State employment service offices. Shoe repair shops and shoe service wholesalers in the community are another source of information about job openings.

Tool-and-Die Makers

(D.O.T. 601.280 except -054; .281-010, -014, and -026; .380-010; .381 except -018 and -038; and 739.381-018 and -022)

Nature of the Work

Tool-and-die makers are highly skilled workers who produce tools, dies, and special guiding and holding devices that are used in metalworking and plastic-working machines. Toolmakers produce jigs and fixtures (devices that hold metal while it is bored, stamped, or drilled). They also make gauges and other measuring devices used in manufacturing precision metal parts. Diemakers construct metal forms (dies) to shape metal in stamping and forging operations. They also make metal molds for diecasting and for molding plastics. Tool-and-die makers also repair worn or damaged tools, dies, gauges, jigs, and fixtures, and help design tools and dies.

Compared with most other machining workers, tool-and-die makers have a much broader knowledge of machining operations, mathematics, and blueprint reading. Tool-and-die makers use almost every type of machine tool and precision measuring instrument. Because they work with all the metals and alloys commonly used in manufacturing, these workers must be familiar with the machining properties, such as hardness and heat tolerance, of a wide variety of metals and alloys.

Working from blueprints or instructions from supervisors, tool-and-die makers plan the sequence of operations necessary to manufacture the tool or die. They measure and mark the pieces of metal that will be cut to form parts of the final product. They then do the cutting, boring, or drilling that is required. They check the accuracy of what they have done to insure that the final product will meet specifications. They then assemble the parts and perform finishing jobs such as filing, grinding, and smoothing surfaces.

In all assignments, tool-and-die makers must work quickly and economically. Taking too much time or wasting materials can reduce their employer's profit.

Working Conditions

Tool-and-die makers usually work in "toolrooms," which are quieter than the production floor because there are not as many machines in use at one time. Machines have guards and shields that minimize the exposure of workers to moving parts. Tool-and-die makers, however, must follow safety rules and wear protective equipment. For examples, safety glasses must be worn to shield against bits of flying metal and earplugs to protect against the noise of the machinery. Tool-and-die makers cannot wear jewelry or loose-fitting clothing that might get caught in the machines. These workers are on their feet most of the day and may do moderately heavy lifting.

Employment

Tool-and-die makers held about 165,000 jobs in 1984. Most work in industries that manufacture tools and dies, metalworking machinery, motor vehicles, aircraft, electrical machinery, and fabricated metal products. Although they are employed throughout the country, jobs are most plentiful in the midwestern and northeastern sections of the country, where many of the metalworking industries are located.

Training, Other Qualifications, and Advancement

A formal apprenticeship program is considered the best way to learn tool-and-die making. Many tool-and-die makers, however, learn the trade informally on the job.

In selecting apprentices, most employers prefer persons with a high school or vocational school education. Courses in shop math, blueprint reading, metalworking, physics, and drafting may help applicants land an apprentice position. Experience operating machine tools also can be helpful. Some employers test apprentice applicants to determine their mechanical aptitude and their mathematical ability.

Most of the 4 or 5 years of a tool-and-die apprenticeship are spent in practical shop training. Apprentices learn to operate milling machines, lathes, grinders, and other machine tools. They also learn to use handtools in fitting and assembling tools, gauges, and other mechanical equipment, and they study heat treating and other metalworking processes. Classroom training consists of shop mathematics, mechanical drawing, tool designing, and blueprint reading. Several years of experience after apprenticeship are often necessary to qualify for the most difficult tool-and-die work. Some companies have separate apprenticeship programs for toolmaking and diemaking.

Workers who become tool-and-die makers without completing formal apprenticeships generally acquire their skills through years of experience as skilled machine-tool operators or machinists. They also may take some classroom training in shop math, blueprint reading, and related subjects.

Skilled tool-and-die makers have numerous paths for advancement. Some advance to supervisory and administrative positions in their firms. Some become tool designers, and others may open their own tool-and-die shops.

Tool-and-die workers must meet high standards of accuracy.

Job Outlook

Employment of tool-and-die makers is expected to increase more slowly than the average for all occupations through the mid-1990's. As the economy grows, the demand for motor vehicles, aircraft, machinery, and other products that use machined metal parts will increase. Rising demand for these goods will increase the need for tools and dies and the workers who make them. Employment growth, however, will be limited by the substitution of nonmetal for metal parts, foreign competition, and changes in metalworking technology. The use of computer-controlled machine tools and improvements in tool design, for example, will lessen the time needed to machine parts for tools and dies, thus increasing the output of tool-and-die makers.

Most openings for tool-and-die makers will occur as workers transfer to other occupations or leave the labor force. Nevertheless, the number of openings will be smaller than in other machining occupations because a smaller proportion of tool-and-die makers than of other machining workers leave their occupation each year. Tool-and-die makers have a strong attachment to their occupation because of their lengthy investment in training.

Because of the long training period, there may be periodic shortages of tool-and-die makers in areas with a great deal of manufacturing activity. Firms often use overtime to meet deadlines when shortages occur.

Employment of tool-and-die makers is less sensitive to fluctuations in the business cycle than many other production occupations. Employers usually are reluctant to lay off these highly skilled workers even when production is cut back because they fear the workers will not be available when economic conditions improve.

Earnings

Median weekly earnings for tool-and-die makers who worked full time were $435 in 1984. Most earned between $335 and $560 a week. Ten percent earned less than $260 a week, while the 10 percent with the highest weekly earnings made more than $710.

In 1984, tool-and-die makers employed in metropolitan areas had average earnings of $13.25 an hour. In comparison, the average for all nonsupervisory workers in private industry, except farming, was $8.33. Table 1 presents average hourly rates in 13 areas selected to show how wage rates for tool-and-die makers differ in various parts of the country.

Table 1. Average hourly earnings of tool-and-die makers, selected areas, 1984

Area	Hourly rate
San Francisco-Oakland	$16.09
San Jose	15.94
Davenport-Rock Island-Moline	14.65
Dayton	14.59
Columbus	14.01
Portland, Maine	11.54
Providence-Warwick-Pawtucket	11.30
Northeast Pennsylvania	10.75
Greenville-Spartanburg	10.33
Worcester	10.19

SOURCE: Bureau of Labor Statistics.

Many tool-and-die makers are members of unions, including the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; and the United Steelworkers of America.

Related Occupations

The occupations most closely related to tool-and-die makers are, of course, the other machining occupations. These include machinists, instrument makers, metalworking machine operators, and tool programmers.

Other occupations that require precision and skill in working with metal include arc cutters, blacksmiths, gunsmiths, locksmiths, metal patternmakers, and welders.

Sources of Additional Information

For information about tool-and-die apprenticeships or other work opportunities in this trade, contact local tool-and-die shops or the nearest office of the State employment service or State apprenticeship agency.

For general information about this occupation, contact:

The National Machine Tool Builders, 7901 Westpark Dr., McLean, Va. 22102.

The National Tooling and Machining Association, 9300 Livingston Rd., Ft. Washington, Md. 20744.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Illinois 60068.

Upholsterers

(D.O.T. 780.381 except -030 and -034; 681-010; 684-122)

Nature of the Work

Upholsterers are skilled craft workers who make new furniture and recondition old furniture. Whether making a new piece of furniture, restoring a treasured antique, or simply giving an ordinary living room couch a facelift, upholsterers combine knowledge of fabrics and other materials with artistic flair and manual skill.

Upholsterers who make new furniture start with the bare wooden frame. Upholsterers who recondition old furniture must first remove the old cover, padding, and springs. Using hammers and tack pullers, they remove tacks or staples that hold the old fabric to the wooden frame. After stripping the old fabric, they remove the burlap and padding that cover the arms, back, sides, and seat. Upholsterers examine the springs and remove broken or bent ones. The springs sit on a cloth mat called webbing that is attached to the frame. If webbing is worn, upholsterers remove all the springs and all the webbing. Upholsterers may reglue loose sections of the frame and refinish exposed wood.

The first step in upholstering new furniture or reupholstering old pieces is to install webbing. Upholsterers tack webbing to one side of the frame, stretch it tight, and tack it to the opposite side. Other webbing is woven across the first row of webbing and attached to the frame to form a new mat. After putting springs on the mat so they compress evenly, upholsterers sew or staple each spring to the webbing or frame and tie each spring to the ones next to it. Burlap then is stretched over the springs, cut and smoothed, and tacked to the frame. To form a smooth rounded surface over the springs and other parts of the frame, upholsterers cover each section of the furniture—seat, back, arms—with filling material. After sewing the filling to the burlap, they cover it with a layer of felt and heavy cloth and tack the cloth to the frame. Finally, upholsterers put on the fabric cover, which has been cut to size for a section such as an arm or the back and temporarily stitched together for fitting. After assuring tight and smooth fit of the cover—or noting where adjustments are necessary—they remove the cover, sew it together, and tack, staple, or glue it to the frame. To complete the job, upholsterers sew, tack, or glue on fringe, buttons, or other ornaments.

Upholsterers use a variety of common handtools, including hammers, staple guns, tack and staple removers,

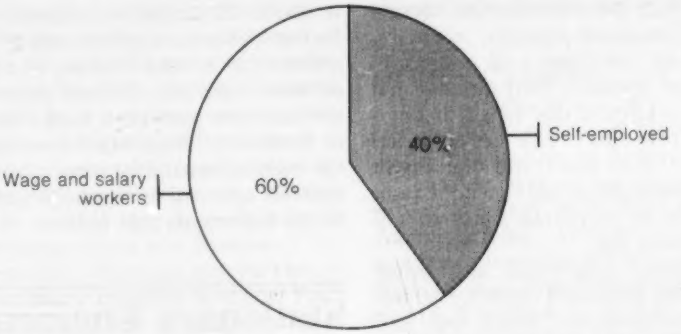
Cutting is a skill needed by furniture upholsterers.

pliers, and shears, and special tools such as webbing stretchers and upholstery needles. They also use sewing machines.

Sometimes upholsterers pick up and deliver furniture or help customers select new furniture coverings. Those who manage an upholstery shop order supplies and equipment and keep business records.

Two out of five furniture upholsterers are self-employed.

Distribution of employment, 1984



SOURCE Bureau of Labor Statistics

Working Conditions

Most upholsterers work inside a shop or factory. Working conditions in these facilities vary—many are spacious, adequately lighted, well ventilated, and well heated; others are small and dusty. Upholsterers stand while they work and do a considerable amount of stooping, bending, and heavy lifting.

Employment

Furniture upholsterers held about 63,000 jobs in 1984. Most work in upholstery shops, either their own or someone else's. These shops generally have fewer than three workers. Some upholsterers work for furniture manufacturers, others are employed by furniture stores, and a few work for businesses, such as hotels, that maintain their own furniture.

Most upholsterers work in metropolitan areas, where the large population provides the greatest demand for upholsterers' services.

Training, Other Qualifications, and Advancement

The best way to enter this trade is through on-the-job training as a helper in an upholstery shop. Helpers learn by upholstering furniture under the direction of experienced workers. Much time and practice are needed to learn complex tasks such as measuring and cutting the new fabric and sewing and attaching it to the frame with a minimum of waste. Usually about 3 to 5 years of on-the-job training are required to become a fully skilled upholsterer.

When hiring helpers, employers generally prefer people with some knowledge of the trade. Inexperienced persons may get basic training in upholstery in high school, vocational and technical schools, and some community colleges. However, additional training and experience usually are required before these workers can perform as quickly and efficiently as experienced upholsterers.

Upholsterers should have manual dexterity, good coordination, and be able to do occasional heavy lifting. An eye for detail and flair for creative use of fabrics are helpful.

The major form of advancement for upholsterers is opening their own shop. It is easy to open a shop because a small investment in handtools and a sewing machine are all that is needed. However, the upholstery business is extremely competitive, so operating a shop successfully is difficult. Experienced, highly skilled upholsterers in large shops and factories may advance to supervisory positions.

Job Outlook

Employment of upholsterers is expected to grow more slowly than the average for all occupations through the mid-1990's. Most job openings will arise because of the need to replace experienced workers who transfer to other occupations, retire, or die.

More upholstered furniture will be used as population, personal income, and business expenditures grow. However, demand for upholsterers will not keep pace with this growth because, increasingly, consumers replace worn furniture rather than reupholster it. Each upholstery job is unique and does not lend itself to automation; consequently, technology is not expected to have any impact on upholsterer employment.

Earnings

In 1984, minimum hourly pay rates ranged from $8 to $12 for experienced furniture upholsterers, according to limited data from union contracts. Employers generally pay inexperienced trainees the minimum wage. Upholsterers usually buy their own handtools.

Some upholsterers are members of the Upholsterers' International Union of North America.

Related Occupations

Other workers who combine manual skills and knowledge of materials such as fabrics and wood are fur cutters, furniture finishers, rug repairers, and shoe repairers.

Sources of Additional Information

For details about work opportunities for upholsterers in your area, contact local upholstery shops, the local office of the State employment service, or a local of the Upholsterers' International Union.

Plant and System Operators

The workers described in this section of the *Handbook* operate, maintain, and repair machinery in industrial plants and systems. They monitor and control equipment that ranges in complexity from the simple boiler in the basement of an apartment building to the technologically advanced equipment used to purify the water supply for an entire city.

Stationary engineers and other powerplant operators control machinery in hydroelectric, fossil fuel, and nuclear powerplants that provide electric energy for factories, office buildings, schools, and homes. Gas plant operators handle machinery that processes and distributes gas to business and residential customers. Water and wastewater treatment plant operators run equipment that purifies and distributes water for human and industrial use, as well as disposes of liquid wastes, such as sewage, chemicals, and radioactive materials. Other plant and systems operators include chemical plant operators and petroleum plant operators.

Plants and systems vary in size, complexity, and degree of automation; some are run by only one operator at a time, others by many. Nevertheless, operators have certain tasks in common. They start up equipment and shut it down; monitor meters, gauges, or control panels; and make adjustments. They monitor or operate switches that control the flow of various materials and substances, take samples and run tests, record instrument readings and switching operations, and make calculations. Operators also perform preventive maintenance tasks and conduct periodic inspections.

Industrial accidents in places such as nuclear powerplants can have very serious consequences, and heightened public concern about safety has led to the use of more technologically advanced monitoring equipment that requires a better trained work force. Therefore, it is not surprising that training requirements for operators have risen in recent years. Training is provided by employers, vocational-technical institutes, community and 2-year colleges, apprenticeship programs, the Armed Forces, and government agencies. Certain plant and systems operators must hold a license or certificate. Detailed information on the training needed for some plant and systems operator occupations appears in the statements that follow.

Stationary Engineers

(D.O.T. 950.362-014, .382 except -014)

Nature of the Work

Stationary engineers operate, maintain, and repair the machinery that provides mechanical and electrical power for industry. They are also responsible for the equipment that heats, air-conditions, refrigerates, and ventilates factories and other buildings. The equipment they tend and control includes boilers, diesel engines, turbines, generators, pumps, condensers, and compressors. Much of it is similar to the nonstationary equipment operated by locomotive and marine engineers.

Stationary engineers start up and shut down equipment in order to meet demands for power and to insure the equipment is operating within established limits. They monitor meters, gauges, and other instruments attached to equipment and make adjustments whenever necessary. They also keep a log of all relevant facts about the operation and maintenance of the equipment. On a steam boiler, for example, they observe, control, and keep records of steam pressure, temperature, water level, power output, and the amount of fuel consumed. Stationary engineers control the flow of fuel to the boiler and the steam pressure by adjusting throttles, valves, or automatic controls.

Stationary engineers must periodically remove from equipment the soot and corrosion that can reduce operating efficiency. They test boiler water and add necessary chemicals to prevent corrosion and buildup of deposits in the boiler.

These workers detect, identify, and correct any trouble that develops. They watch and listen to their machinery and routinely check safety devices. Often stationary engineers use hand or power tools to make repairs, ranging from a complete overhaul to replacing defective valves, gaskets, or bearings.

In a large plant, the stationary engineer may be in charge of the powerplant or engine room and direct the work of assistant stationary engineers, turbine operators, boiler tenders, and air-conditioning and refrigeration operators and mechanics. In a small plant, the stationary engineer may be the only person operating and maintaining equipment.

Working Conditions

Stationary engineers generally have steady year-round employment. They usually work a 5-day, 40-hour week. In plants that operate around the clock, they may be assigned to any one of three shifts—often on a rotating basis—and to Sunday and holiday work.

Engine rooms, powerplants, or boiler rooms usually are clean and well lighted. Even under the most favorable conditions, however, some stationary engineers are exposed to high temperatures, dust, dirt, and high noise levels from the equipment. General maintenance duties may cause contact with oil and grease, and fumes or smoke. Workers are on their feet a lot; they also may have to crawl inside boilers and work in crouching or kneeling positions to inspect, clean, or repair equipment.

Because stationary engineers work around boilers and electrical and mechanical equipment, they must be alert to avoid burns, electric shock, and injury from moving machinery.

Employment

Stationary engineers held about 54,000 jobs in 1984. They work in a wide variety of places, including factories, hospitals, schools, office and apartment buildings, shopping malls, hotels, and power stations. Usually, plants that operate on three shifts employ four to eight stationary engineers, but some have more. In many plants, only one engineer works on each shift.

Because stationary engineers work in so many different kinds of industries, they are employed in all parts of the country. Although some are employed in small towns and in rural areas, most work in the more heavily populated areas where large industrial and commercial businesses are usually located.

Training, Other Qualifications, and Advancement

Many stationary engineers start as helpers or oilers and acquire their skills through informal on-the-job experience. They usually become boiler tenders before advancing to stationary engineers. A good background also can be obtained in the Navy or Merchant Marine. However, most training authorities recommend formal apprenticeship programs because of the increasing complexity of power generating machines and systems—for example, the increasing use of computers and remote controls. Apprenticeship programs are sponsored by the International Union of Operating Engineers and the International Brotherhood of Firemen and Oilers, the principal unions to which stationary engineers belong.

In selecting apprentices, most local labor-management apprenticeship committees prefer high school or trade school graduates who have received instruction in mathematics, mechanical drawing, machine-shop practice, physics, and chemistry. Mechanical aptitude, manual dexterity, and good physical condition also are important qualifications.

The apprenticeship usually lasts 4 years. In addition to on-the-job training, apprentices receive classroom instruction in practical chemistry, elementary physics, blueprint reading, applied electricity, instrumentation, electronics, and other technical subjects.

Becoming a stationary engineer without going through a formal apprenticeship program usually takes many years of experience as an assistant to a licensed stationary engineer or as a boiler tender. This practical experience can be supplemented by technical or other school training or home study.

Many States and cities have licensing requirements for stationary engineers. Although requirements differ from place to place, applicants usually must be at least 18 years of age, reside for a specified period in the State or locality in which the examination is given, meet the experience requirements for the class of license requested, and pass a written examination. Because of regional differences in licensing requirements, a stationary engineer who moves from one State or city to another may have to pass an examination for a new license.

Generally, there are several classes of stationary engineer licenses. Each class specifies the steam pressure or horsepower of the equipment the engineer can operate without supervision. The first-class license permits the stationary engineer to operate equipment of all types and capacities. An applicant for this license may be required to have a high school education and an approved apprenticeship or on-the-job training. The lower class licenses limit the capacity of the equipment the engineer may operate without the supervision of a higher rated engineer.

Stationary engineers advance to more responsible jobs by being placed in charge of larger, more powerful, or more varied equipment. Generally, engineers advance to these jobs as they obtain higher class licenses. Advancement, however, is not automatic. For example, an engineer who has a first-class license may work for some time as a boiler tender or an assistant to another first-class engineer before a vacancy occurs. Some stationary engineers eventually advance to jobs as boiler inspectors, plant engineers, and as building and plant superintendents. A few obtain jobs as examining engineers and technical instructors.

Job Outlook

Employment of stationary engineers is expected to grow more slowly than the average for all occupations through the mid-1990's. Although expanding industrial needs for mechanical and electrical power and the trend toward more plants generating their own power are expected to spur employment growth, increased automation should limit the number of new stationary engineer jobs. Most job openings will result from the need to replace experienced workers who transfer to other occupations or leave the labor force.

Due to the increasing complexity of power generating systems, the most highly skilled stationary engineers should have the best job prospects.

Earnings

Stationary engineers had average hourly earnings of $12.58 in 1984, according to a survey of metropolitan areas. This was about 50 percent higher than the average for all nonsupervisory workers in private industry, except farming. Average earnings for engineers in metropolitan areas ranged from $8.36 in Greenville-Spartanburg, South Carolina to $15.04 in San Francisco-Oakland, California.

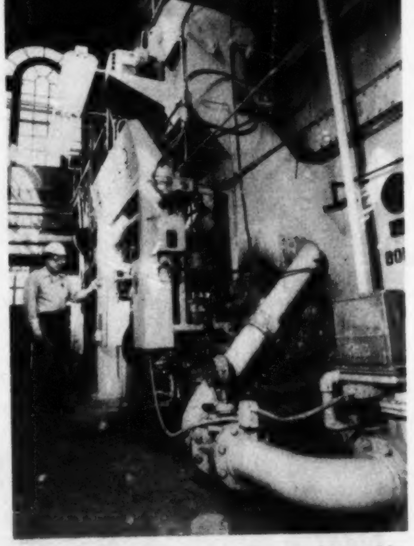
The principal unions to which these workers belong are the International Union of Operating Engineers and the International Brotherhood of Firemen and Oilers.

Related Occupations

Other workers who monitor and operate stationary machinery include nuclear reactor operators, power station operators, water and sewage treatment plant operators, waterworks pump-station operators, chemical operators, and refinery operators.

Sources of Additional Information

Information about training or work opportunities is available from local offices of State employment services,



Stationary engineers monitor equipment to make sure it is operating within established limits.

locals of the International Union of Operating Engineers, and from State and local licensing agencies.

Specific questions about the occupation should be addressed to:

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

National Association of Power Engineers, Inc., 2035 East Devon St., Suite 115, Des Plaines, Ill. 60018.

For licensing requirements, contact:

National Institute for Uniform Licensing of Power Engineers, 1436 Fritz Rd., Verona, Wis. 53593.

Water and Sewage Treatment Plant Operators

(D.O.T. 954.382-010, -014; and 955.362, .382, and .585)

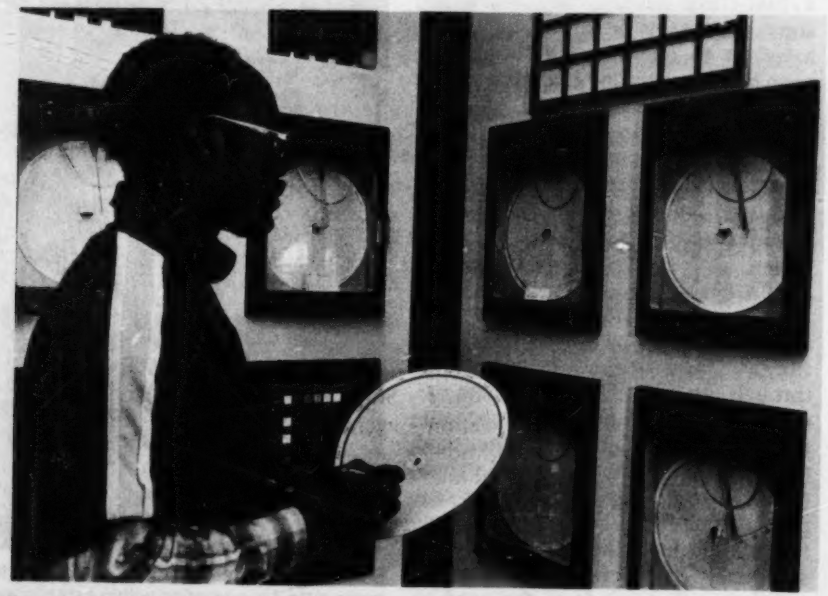
Nature of the Work

Clean water is essential for many things: Health and recreation; the existence of fish and wildlife; and the functioning of industries. Water treatment plant operators treat water so that it is pure and safe to drink. Sewage or wastewater treatment plant operators remove harmful domestic and industrial pollution from sewage.

Water is pumped from rivers and streams to water treatment plants. Waste materials are carried by water through sewer pipes to sewage treatment plants. Operators in both types of plants control processes and equipment to remove solid materials, chemicals, and organisms from the water or render them harmless. By operating and maintaining the pumps, pipes, valves, and processing equipment of the treatment facility, operators move the water or sewage through the various treatment processes.

Operators read and interpret meters and gauges to make sure plant equipment and processes are working properly and adjust controls as needed. They operate chemical-feeding devices; take samples of the water or sewage and perform chemical and biological laboratory analyses; and test and adjust the level of chlorine in the sewage. Operators also make minor repairs to valves, pumps, and other equipment. They use gauges, wrenches, pliers, and other common handtools, as well as special tools. Occasionally operators must work under emergency conditions. A heavy rainstorm, for example, may cause an amount of sewage to flow into sewerpipes that exceeds a plant's treatment capacity. Emergencies also can be caused by conditions inside a plant, such as chlorine gas leaks or oxygen deficiencies.

The duties of operators vary depending on the type and size of plant. In smaller plants, one operator may control all machinery, perform tests, keep records, handle complaints, and do repairs and maintenance. The operators even may handle both a water treatment and a sewage treatment plant. In larger plants, with many employees, operators may be assigned to one process or one station, and the staff may include chemists, engineers, laboratory technicians, mechanics, helpers, supervisors, and a superintendent.


Operators read and interpret meters and gauges to make sure equipment and processes are working properly.

Water pollution standards have become increasingly stringent since adoption of the Federal Water Pollution Control Act of 1972. To implement the law, a national system of uniform controls on the discharge of pollutants was set in motion. Under the 1972 law, as amended by the Clean Water Act of 1977, it is illegal to discharge any pollutant without a permit. Industrial facilities that send their wastes to municipal treatment plants must meet certain minimum standards and insure that these wastes have been adequately pretreated so that they do not damage municipal treatment facilities. Municipal treatment plants must also meet discharge standards. In order to meet these requirements, operators will have to be able to operate more sophisticated systems.

Working Conditions

Water and sewage treatment plant operators work both indoors and outdoors and may be exposed to noise from machinery and unpleasant odors, although chlorine and other chemicals are used to minimize these. Persons with allergies might suffer due to dust and other substances in the air. Operators have to stoop, reach, and climb and often get their clothes dirty. Sometimes they are confronted with hazardous conditions, such as slippery walkways, dangerous gases, and malfunctioning equipment. Because plants operate around the clock, operators are required to work shifts and on weekends and holidays. During emergencies, overtime is common.

Employment

Water and sewage treatment plant operators held about 82,000 jobs in 1984. The vast majority worked for local governments; some worked for private water supply companies and chemical manufacturing companies. About 1,800 were employed by the Federal Government, mostly by the Armed Forces.

Water and sewage treatment plant

operators are employed throughout the country. Geographically, employment is distributed much like the Nation's population, with most jobs in larger towns and cities. Many operators in small towns are employed part time or handle additional duties.

Training, Other Qualifications, and Advancement

Trainees usually start as attendants or operators-in-training and learn their skills on the job under the direction of an experienced operator. They learn by observing the processes and equipment in operation and do routine tasks such as recording meter readings; taking samples of sewage and sludge; and doing simple maintenance and repair work on pumps, electric motors, and valves. They also clean and maintain plant equipment and property. Larger treatment plants generally have more formal "in-house" training programs.

Operators need mechanical aptitude and should be competent in basic mathematics. Employers generally prefer trainees who have a high school diploma or its equivalent. In some States this is a minimum educational requirement. Some positions, particularly in larger cities and towns, are covered by civil service regulations, and applicants may be required to pass written examinations testing elementary mathematics skills, mechanical aptitude, and general intelligence. Operators must be agile, since they have to climb ladders and move easily around heavy machinery.

Some 2-year programs leading to an associate degree in wastewater technology and 1-year programs leading to a certificate are available; these provide a good general knowledge of water pollution control as well as basic preparation for becoming an operator. Because plants are becoming more complex, completion of such courses increases an applicant's chances for employment and promotion.

Most State water pollution control agencies offer training courses to improve operators' skills and knowledge. These courses cover principles of treatment processes and process control, laboratory procedures, odors and their control, safety, chlorination, sedimentation, biological oxidation, sludge treatment and disposal, and flow measurements. Some operators take correspondence courses on subjects related to sewage treatment, and some employers pay part of the tuition for related college courses in science or engineering.

Operators may be promoted to plant supervisor or superintendent. A high school diploma and increasingly responsible experience as an operator may be sufficient to qualify for superintendent of a small plant, since at many small plants the superintendent also serves as an operator. However, educational requirements are rising as larger, more complex treatment plants are built to meet new water pollution control standards. Superintendents of large plants generally need an engineering or science degree. A few operators get jobs with State water pollution control agencies as technicians, who monitor and provide technical assistance to plants throughout the State. Vocational-technical school or community college training generally is preferred for technician jobs. Experienced operators may transfer to related jobs with industrial sewage treatment plants, companies selling sewage treatment equipment and chemicals, engineering consulting firms, or vocational-technical schools.

In 44 States, supervisors and certain operators must pass an examination to certify that they are capable of overseeing treatment plant operations. Voluntary certification programs are in effect in the remaining States. Typically, there are different classes of certification for different sizes of treatment plants.

Job Outlook

Employment of water and sewage treatment plant operators is expected to grow about as fast as the average for all occupations through 1995. Most employment growth will occur by the early 1990's in order to staff new and existing plants. Thereafter, growth should moderate due to an anticipated slowdown in the rate of construction of new treatment plants. In addition, automation of existing plants may decrease the need for some lesser skilled operators. However, many job openings will occur as experienced operators transfer to other occupations or leave the labor force. Persons with formal postsecondary training in wastewater technology will have the competitive edge in being hired or advancing to supervisory positions.

People who enter this field generally have steady employment because treatment of water is essential even during economic downturns.

Earnings

According to a survey conducted by the Water Pollution Control Federation, annual salaries of wastewater treatment plant operators averaged $18,700 in 1984; salaries of supervisors averaged $21,700. Salaries depend, among other things, on the size of the plant, the complexity of the operator's job, and the operator's level of certification.

Related Occupations

Other workers whose main activity consists of operating a system of machinery to process or produce materials include boiler operators, gas-compressor operators, powerplant operators, power reactor operators, stationary engineers, turbine operators, and waterworks pump-station operators.

Sources of Additional Information

For further information on training, contact:

National Environmental Training Association, 158 S. Napoleon St., P.O. Box 346, Valparaiso, Ind. 46383.

For information on certification, contact:

Association of Boards of Certification, 520 Grant Ave., Ames, Iowa 50010.

Additional information is available from:

Water Pollution Control Federation, 2626 Pennsylvania Ave. NW., Washington, D.C. 20037.

For information on jobs, contact State or local water pollution control agencies or local offices of the State employment service.

Machine Operators, Tenders, and Setup Workers

Workers in this occupational group set up, adjust, operate, and tend numerous kinds of machinery and equipment. These workers generally have job titles related to the type of machine they handle such as rolling machine setup operator, printing press operator, sewing machine operator, and motion picture projectionist.

Skilled machine setup operators adjust the speed, feed, and other controls on machines according to the specifications of a particular product or job. They then test the machines to make certain they are functioning properly and producing parts that conform to job specifications. After this determination has been made, semiskilled machine operators begin production. It is their job to control and monitor machines and equipment and make necessary adjustments during production.

In small establishments, workers may perform a wider range of tasks than in large establishments, where workers' duties may be more specialized. Some skilled workers may set up, operate, and tend equipment throughout the production process.

Most machine operators, tenders, and setup workers are employed in factories in the mass production of goods. Working conditions in factories have improved substantially in recent years. The use of modern equipment and safety procedures has reduced the rate of accidents. Factories, for the most part, are clean and well lighted; some modern ones are air-conditioned. Nevertheless, many workers are exposed to unpleasant conditions. For example, electroplaters and boiler tenders are subjected to fumes. Forge shops can be very hot and noisy. And working around even the most modern high-speed machines can still be dangerous. Because of the repetitive nature of some tasks, machine operators, tenders, and setup workers may find their jobs tedious and boring.

Persons interested in these jobs should have manual dexterity and be mechanically inclined to use the tools and machinery required in their work. Physical stamina is important because many machine operators, tenders, and setup workers, such as transportation equipment painters, must stand for long periods of time and do a considerable amount of reaching and bending. Physical strength is essential for jobs such as printing press operator and electroplater, which require some heavy lifting and carrying. Precision, accuracy, and the ability to visualize three-dimensional objects from drawings also are important characteristics for many of these workers.

Many jobs as machine operators, tenders, and setup workers do not require a high school diploma. However, employers often prefer high school or vocational school graduates who have taken courses in mathematics, machine shop, and blueprint reading.

Most workers learn these jobs through on-the-job training provided by their employers. Skilled workers, such as machine tool setup workers, often complete formal apprenticeship programs. Some experienced workers may be required to take courses to keep abreast of new technologies.

This section of the *Handbook* includes statements on selected machine operators, tenders, and setup workers. In addition to more detailed information on the nature of the work, employment, working conditions, and training requirements, these statements discuss job outlook and earnings.

Metalworking and Plastic-Working Machine Operators

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

Durable goods such as aircraft, motor vehicles, and industrial equipment contain thousands of metal and plastic parts. These parts are made on a variety of machines that cut, shape, stamp, or otherwise form metal and plastic. Metalworking and plastic-working machine operators run these machines.

Operators usually are identified by the kind of machine they run, such as lathe operator, milling machine operator, drill press operator, and punch press operator. Although some operators can work with a variety of machine tools, most specialize in one or two types.

Most operators only tend machines, performing simple, repetitive operations that can be learned relatively quickly. Typically, these operators place metal or plastic stock in a machine on which the speeds and operation sequence already have been set. Operators may watch one or more machines and make minor adjustments according to their instructions. However, they depend on skilled setup workers for major adjustments when their machines are not working properly.

Some operators perform more varied and complex machining operations. Skilled machine operators plan and set up the correct sequence of operations according to blueprints, layouts, or other instructions. They adjust speed, feed, and other controls, and select the proper instruments or tools for each operation. Using micrometers, gauges, and other precision measuring instruments, they compare the completed work with the tolerance limits given in the specifications. They also may select coolants to keep the workpiece from getting too hot, and lubricants to keep the machine tools running smoothly.

Working Conditions

Most machine shops are well lighted and well ventilated. However, powerful, high-speed machines can be dangerous if strict safety rules are not observed. Operators must wear protective equipment such as safety glasses and earplugs to shield against flying metal particles and noise from machines. They cannot wear loose-fitting clothes or jewelry that might get caught in the machine, injuring the operator. The work requires stamina because operators are on their feet much of the day and may do moderately heavy lifting.

Employment

Metalworking and plastic-working machine operators held about 953,000 jobs in 1984. The distribution of employment among specific operator occupations is presented in the following tabulation:

	Percent
Total	100
Machine forming operators, metal and plastic	18
Machine tool cutting operators, metal and plastic	18
Combination machine tool setters, operators, and tenders	11
Lathe machine tool setters, metal and plastic	10
Grinding machine setters, metal and plastic	10
Drilling machine tool operators, metal and plastic	7
Punch machine setters, metal and plastic	7
Press machine setters, metal and plastic	5
Other machine tool operators	14

Most operators work in factories that produce fabricated metal products, transportation equipment, and machinery in large quantities. They are concentrated in the midwestern and northeastern sections of the country where such manufacturing activity is centered.

Training, Other Qualifications, and Advancement

Most operators learn their skills on the job. Beginners usually start by observing experienced operators at work. When trainees first operate a machine, they are supervised closely by more experienced workers. After gaining some experience, beginners often take over more of the duties of operating the machines. For example, they may learn to adjust feed speeds and cutting edges, instead of calling upon other workers to perform these tasks. Some also may learn to read blueprints, plan the sequence of work, and learn to use measuring instruments to check work.

Most operators specialize in working on one or two types of machines.

Individual ability and effort largely determine the time required to become an operator. Most operators learn the basic machine operations and functions in a few months, but becoming a skilled operator often requires 1 to 2 years. Some companies have formal training programs for new employees.

Although no special education is required, persons interested in this occupation can improve their opportunities by completing high school courses in mathematics and blueprint reading. In hiring beginners, employers often look for persons with mechanical aptitude and some experience in working with machinery. Physical stamina is important since much time is spent standing. Applicants should be able to work independently. They also should not mind working in a relatively small workspace.

Advancement opportunities in these occupations are limited. Some workers advance to supervisory jobs or transfer to trainee jobs for skilled occupations such as machinist and tool-and-die maker.

Job Outlook

Little change is expected in the overall employment of metalworking and plastic-working machine operators through the mid-1990's. Although employment in the two most highly skilled occupations will increase significantly, employment in the remaining occupations in this group is expected to decline. However, because of the large size of this group of occupations, many thousands of openings are expected to occur each year as operators transfer to other fields of work, retire, or die.

The demand for metal and plastic parts is expected to increase as the economy expands. However, foreign competition and improvements in manufacturing technology will prevent employment from rising as rapidly as the demand for parts. Many of the industries that employ metalworking and plastic-working machine operators face increasing competition from foreign firms. In industries such as motor vehicles and steel, foreign firms have captured significant proportions of the market and U.S. firms have had to cut production and lay off workers. In addition, many U.S. firms have moved production operations to other countries to lower costs. Such moves have lowered employment opportunities in these occupations.

In order to remain competitive, many U.S. firms are adopting technologies that increase productivity. Computer-controlled machine tools, robots, and automated material handling equipment, for example, are used together in flexible machining systems. In these systems, the automated material handling equipment moves workpieces through a series of work stations. At each work station, a robot loads the piece onto a computer-controlled machine and removes it when the processing is complete. The workpiece is then moved to the next work station for further processing. In such systems, operators can tend several machines. Other improvements that will offset employment include the use of tools that cut metal faster and improved computer controls. Workers with thorough backgrounds in machine operations, mathematics, blueprint reading, and a good working knowledge of the properties of metals and plastics will be better able to adjust to the changing job requirements that will result from technological advances.

The number of openings may fluctuate greatly from year to year due to changes in economic conditions. When demand slackens for motor vehicles, aircraft, and other durable goods, production runs may be stopped or restricted, and workers may be laid off or face a shortened workweek.

Earnings

Median weekly earnings of metalworking and plastic-working machine operators were $325 in 1984. Most earned between $250 and $445 a week. Ten percent of all operators had median weekly earnings of less than $200, while the 10 percent with the highest earnings made more than $555 a week.

Operators are paid according to hourly or incentive rates, or by a combination of both methods. In 1984, hourly earnings of machine operators ranged from about $7.60 to $10.80, according to a survey by the National Tooling and Machining Association. Rates vary, depending on the type of machine operated. In comparison, the average hourly rate for all production workers in private industry, except farming, was $8.33.

Many metalworking and plastic-working machine operators belong to unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; and the United Steelworkers of America.

Related Occupations

Occupations most closely related to metalworking and plastic-working machine operators are the other metalworking occupations. These include machinists, tool-and-die makers, instrument makers, blacksmiths, gunsmiths, locksmiths, metal patternmakers, and welders.

Sources of Additional Information

For information about work opportunities in these occupations, contact the nearest office of the State employment service.

For general information about this occupation, contact:

The National Machine Tool Builders, 7901 Westpark Dr., McLean, Va. 22102.

The National Tooling and Machining Association, 9300 Livingston Rd., Ft. Washington, Md. 20744.

The National Screw Machine Products Association, 6700 W. Snowville Rd., Breckville, Ohio 44141.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068.

Numerical-Control Machine-Tool Operators

(D.O.T. 604.362; 605.360, .380; 606.362, .382-014; 609.662; and 617.280)

Nature of the Work

People generally associate manufacturing with mass production. However, the manufacture of industrial equipment, aircraft, and many other products involves machining—cutting or forming metal or plastic workpieces into parts for final products—that is done in small batches. For decades, batch production was done by skilled workers using machine tools such as milling machines and lathes. During the late 1940's, the increasing complexity and cost of parts for aircraft led the Air Force to sponsor research at the Massachusetts Institute of Technology to develop machine tools that could be programmed to make parts of different dimensions automatically. The result was the development in 1952 of the first numerically controlled machine tool. These machines bring the benefits of automation to batch production.

Numerical control machine tools have two major components: An electronic controller (a type of computer) and a machine tool. The controller directs the mechanisms of the machine tool through the positioning and machining described in the computer program for the job. A program, for example, could contain commands that cause the controller to move a drill bit to certain spots on a workpiece and drill a hole at each spot. Many types of machine tools—milling machines, lathes, punch presses, and others—can be numerically controlled. Each can do certain types of machining. A workpiece might have to be worked on by several machines before it is finished. Although the machining is done automatically, numerically controlled machine tools must be set up and used properly in order to obtain the maximum benefit from their use. These tasks are the job of numerical-control machine-tool operators.

The duties of these operators vary. In some shops, operators merely tend one machine. In others, they might program and tend machines, operate more than one machine at a time, or operate more than one type of machine. Although there are many variations in operators' duties, they generally involve the tasks described below.

Working from written instructions or directions from supervisors, operators must position the workpiece, attach the necessary tools, and load the program into the controller. The machine tool cannot "see" the workpiece, but moves and operates in relation to a fixed starting point on the piece. It is, therefore, critical that operators position the workpiece correctly or all subsequent machining will be wrong. Operators also must secure the workpiece to the worktable correctly, so the piece does not move while it is machined. During the set-up and running of a job, operators must install the proper tools in the machine. Many numerically controlled machines are equipped with automatic tool changers, so operators have to load several tools in the proper sequence. The time an operator needs to position and secure the workpiece and load the tools may be only a few minutes or several hours, depending on the size of the workpiece and complexity of the job.

The way a program is loaded into a controller depends on how it is stored. If the program is stored on a paper or magnetic tape, the tape must be run through a tape reader that transmits the program to the controller. Increasingly, machine-tool controllers are connected to minicomputers. Operators load programs that are stored on discs or tapes directly into the controller via the computer.

The first time a program is run, it must be 'debugged,' or corrected. If the tool moves to the wrong position or makes a cut that is too deep, for example, the program must be changed so the job is done properly. Some employers have numerical-control machine-tool operators debug the program. Others have tool programmers handle the first run.

When a job is properly set up and the program has been checked, the operator merely has to monitor the machine as it operates. Some jobs require frequent loading and unloading, changing of tools, or constant attention to insure that the machining is proceeding properly. For other jobs, the machine can run unattended for hours. In these cases, the operators may set up other machines, finish or inspect completed parts, or do other tasks. Operators check the finished part using micrometers, gauges, or other precision inspection equipment to insure it meets specifications.

Working Conditions

Working conditions generally are good in machine shops. Because there are hazards connected with operating machine tools, machines have guards and shields that minimize the operators' exposure to moving parts. Operators must follow safety rules and may have to wear protective equipment, such as safety glasses and earplugs. They cannot wear loose-fitting clothes or jewelry that might get caught in the machines. The job requires stamina because operators stand most of the day and may lift moderately heavy workpieces onto the worktable. In some shops, operators may have to work evening or night shifts.

Employment

Numerical-control machine-tool operators held about 57,000 jobs in 1984. Most work in industries that manufacture durable goods, such as metalworking machinery, aircraft, and construction equipment. Jobs are concentrated in metropolitan areas in the northeastern and midwestern parts of the country where durable goods manufacturing is centered.

Training, Other Qualifications, and Advancement

This generally is not an entry level job. Employers prefer to fill operator jobs in-house. They select machine-tool operators or shop helpers who have some experience in machine-tool operation and have demonstrated good work habits and mechanical aptitude. Courses in shop math and blueprint reading may improve an employee's chances of getting selected for an operator job.

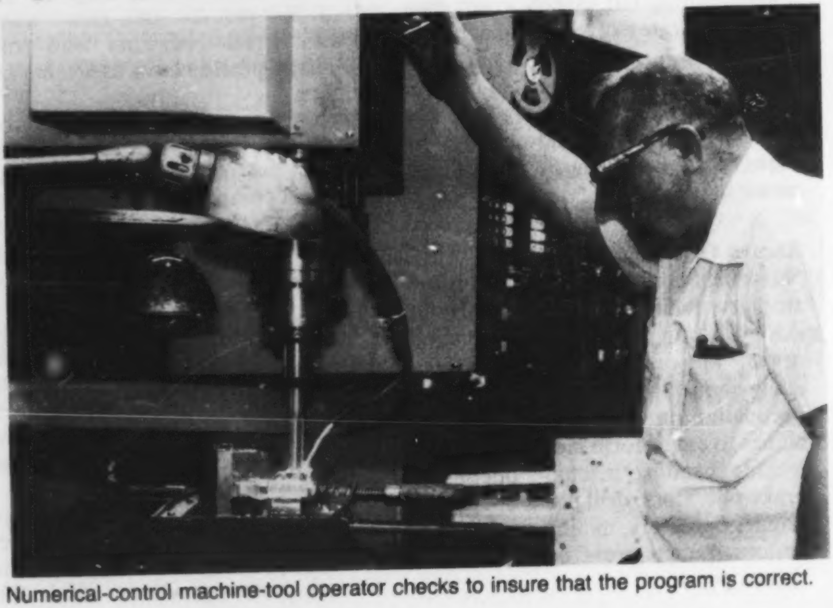
Working under a supervisor or an experienced operator, trainees learn to set up and run one or more kinds of numerically controlled machine tools. Trainees usually learn the basics of their job within a few weeks. However, the length of the training period varies with the number and complexity of the machine tools the operator will run and the individual's ability. If the employer expects operators to write programs, trainees may attend programming courses offered by machine-tool manufacturers. These courses usually last 1 to 2 weeks.

Numerical-control machine-tool operators may advance to supervisory jobs. Operators who get sufficient training in numerical-control programming can move to the higher paying job of tool programmer.

Job Outlook

Employment of numerical-control machine-tool operators is expected to increase faster than the average for all occupations through the mid-1990's. In addition to openings arising from growth in demand for these workers, many openings are expected to occur as operators transfer to other fields of work, or leave the labor force.

Although numerically controlled machine tools have been available since the 1950's, few companies used them until the late 1970's. Most firms were unwilling to invest in an unfamiliar technology. Increasing competition from foreign companies has forced American manufacturers of metalworking, industrial, and transportation equipment to adopt numerically controlled machine tools and other equipment that enables them to control costs and improve quality. In addition to being used alone, numerically controlled machines are increasingly being used as part of flexible machining systems. In these systems, automated material handling equipment moves workpieces through a series of work stations. At each work station, a robot loads the piece onto a numerically controlled machine and



Numerical-control machine-tool operator checks to insure that the program is correct.

removes it when the machining is complete. The workpiece is then moved to the next work station for further processing. The increased use of numerically controlled machines is expected to increase the demand for operators. Improvements to these machines may keep employment from growing as rapidly as the number of machines, however. The use of adaptive controls—sensors that automatically monitor and adjust machine operations—can be expected to lower the time an operator must spend monitoring the machine. Improvements in the controllers and in the software used for programming them also are likely to increase operator productivity and limit the rate of employment growth somewhat.

Employment of numerical-control machine-tool operators may fluctuate from year to year because this occupation is concentrated in industries that are sensitve to changes in the level of economic activity. A drop in the demand for aircraft, machinery, or other equipment lessens the need for operators and may result in layoffs or shortened workweeks.

Earnings

In 1984, numerical-control machine-tool operators earned about $9.25 an hour, according to a survey by the National Tooling and Machining Association. This rate is about 10 percent higher than the average hourly earnings for all production workers in manufacturing but slightly lower than the hourly rates of skilled machining workers such as machinists and tool-and-die makers. Numerical-control machine-tool operators generally work 40 hours a week; however, overtime is common during periods of high manufacturing activity.

Related Occupations

Numerical-control machine-tool operators use their skill and knowledge of machines and processes to set up and operate one or more types of automatically controlled machine tools. Other occupations in which workers use machines to cut or form metal and plastic include bending machine operators, brake operators, drill press operators, grinder operators, milling machine operators, punch press operators, and shear operators.

Sources of Additional Information

For information about job opportunities in this occupation, contact the nearest office of the State employment service.

For general information about this occupation, contact:

The National Machine Tool Builders, 7901 Westpark Dr., McLean, Va. 22102.

The National Tooling and Machining Association, 9300 Livingston Rd., Ft. Washington, Md. 20744.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068.

Printing Press Operators

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

Printing press operators prepare and operate the printing presses in a pressroom. Before starting the press, press operators set it up and adjust it to insure that the printing impressions will be distinct and uniform. Press operators first insert and lock type setups or plates into the press bed and tighten the locking attachment with a wrench. The operators then level the pressplates by placing pieces of paper that are exactly the right thickness underneath low areas of the plates. Press operators also adjust control margins and the flow of ink to the inking roller, feed paper through the press' rollers, and adjust feed controls. In some shops, they oil and clean the presses and make minor repairs. Press operators who work with large presses have assistants and helpers.

Press operators' jobs differ from one shop to another because of differences in the kinds and sizes of presses. Small commercial shops generally have relatively simple manual presses, whereas large newspaper, magazine, and book printers use giant presses that require a crew of several press operators and press assistants. These presses are fed paper in big rolls called "webs" up to 50 inches or more in width. Workers print the paper on both sides; cut, assemble, and fold the pages; and count the finished sections as they come off the press.

Many modern plants have installed printing presses that use computers and sophisticated instrumentation to control press operations. With this equipment, the press operator monitors a control panel that detects problems. To adjust the press, the operator pushes the proper button on the control panel. Press operators are generally designated according to the type of press they operate: Letterpress, gravure, offset, or flexography.

Working Conditions

Operating a press can be physically demanding. Press operators are on their feet most of the time. Web offset is capable of high printing speeds, and adjustments must be made quickly to avoid waste. Pressrooms are noisy, and workers in certain areas frequently wear ear protectors. Press operators are subject to hazards when working near machinery. Often, they work under pressure to meet deadlines. Many press operators work evening and night shifts.

Employment

Press operators held about 222,000 jobs in 1984, distributed as follows:

Printing press machine operators and tenders	113,000
Offset lithographic press setters and setup operators	69,000
Letterpress setters and setup operators	21,000
All other	19,000

About half of these jobs were in commercial printing shops and book and magazine publishing firms. Others were in newspaper plants. Some jobs were in banks, insurance companies, paper manufacturers, and other organizations that do their own printing, such as Federal, State, and local governments.

Printing and publishing is one of the most geographically dispersed industries in the United States, and press operators can find jobs throughout the country. However, jobs are concentrated in large printing centers such as New York, Los Angeles, Chicago, Philadelphia, Washington, D.C., and Dallas.

Training, Other Qualifications, and Advancement

Press operators learn their trade through apprenticeship or while on the job. The length and content of training depend largely on the kind of press used in the plant. Most press operators are trained to operate more than one press, but specialize in a

Printing press operators must be ready to make quick adjustments to avoid waste.

particular area of printing such as lithography, letterpress, or gravure.

Apprenticeship, once the dominant method of preparing for this occupation, is becoming less prevalent as formal programs of retraining and skills updating for experienced operators take on greater importance. Nonetheless, 2 out of 5 persons training to be printing press operators are in apprenticeship programs, according to a recent estimate. The apprenticeship period in commercial shops is 4 years for press operators. In addition to on-the-job instruction, the apprenticeship includes related classroom or correspondence school courses. Courses in printing provide a good background. Because of technical developments in the printing industry, courses in chemistry, electronics, color theory, and physics are helpful. Postsecondary education is increasingly important because of the theoretical knowledge needed to operate advanced equipment.

Mechanical aptitude is important in making press adjustments and repairs. An ability to visualize color is essential for work on color presses.

Technological changes have had a tremendous effect on the skills needed by press operators. For example, printing plants which change from sheet-fed offset presses to web-offset presses have to retrain their entire press crew because the skill requirements for the two types of presses are very different. Web-offset presses, with their faster operating speeds, require faster decisions, monitoring of more variables, and greater physical effort.

Press operators may advance in pay and responsibility by taking a job working on a more complex printing press. For example, a two-color sheet-fed press operator may become a four-color sheet-fed press operator. Others may advance to press operator-in-charge and be responsible for the work of the entire press crew.

Job Outlook

Employment of press operators is expected to grow about as fast as average for all occupations through the mid-1990's. Increased use of color producing presses will contribute to job growth because this technology is more labor intensive than other printing technologies. In general, however, productivity improvements centering around faster and more efficient web-offset presses will permit the rapidly growing demand for printed materials to be met with a very moderate rise in the number of offset press operators, while jobs for letterpress operators will continue to disappear. Technological breakthroughs—the application of microprocessors to printing and binding equipment, for example—could further reduce labor requirements in the years ahead. Most opportunities for printing press operators will reflect the need to replace experienced workers who leave the occupation.

Apprenticeship training is more likely to be required of individuals entering this occupation than other printing occupations. They will face stiff competition for jobs from experienced workers and workers who have completed retraining programs.

Earnings

The basic wage rate for a press operator depends on the type of press being run and the area of the country in which the work is located. The basic wage rate for letterpress operators in unionized firms was $13.38 an hour in late 1984, according to the Graphic Communications International Union. Lithographic press operators on a single-color 19x25-inch press earned $14.81 an hour in 1984, on average. Operators working on larger, multicolor presses earned more.

Related Occupations

Other workers who set up and operate production machinery are papermaking machine operators, shoemaking machine operators, bindery machine operators, and precision machine operators.

Sources of Additional Information

Details about apprenticeships and other training opportunities may be obtained from local newspapers and printing shops, local offices of the Graphic Communications International Union, or local offices of the State employment service.

For general information about press operators, write to:

Graphic Communications International Union, 1900 L St. NW., Washington, D.C. 20036.

Education Council of the Graphic Arts Industry, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Fabricators, Assemblers, and Handworking Occupations

These workers produce manufactured goods using handtools and hand-held power tools. They perform tasks ranging from the repetitive to the highly intricate.

Most entry level jobs require relatively little formal education, and few employers insist on a high school diploma. What counts is the ability to perform. Workers acquire their skills on the job, usually in a matter of days or weeks. Two notable exceptions are precision electrical and electronic equipment assemblers, who generally need technical school training or the equivalent, and welders, who often learn their trade in formal programs.

Many of these occupations involve highly repetitive work and require minimum skills. This is the kind of work where commercial robots are most productive. In the years ahead, as manufacturers strive to raise productivity, an increasing number of jobs will be lost to these mechanical workers and other automated procedures. The use of robots for assembling, painting, and welding already is well established in the automobile industry, and, by the mid-1990's, other industries will have adopted robotics, computer-assisted design and manufacture, and other laborsaving technologies. Electrical and electronic product assembly probably will be among the next to experience job losses due to automation.

Other assembly jobs will be lost to "outsourcing"—the practice of moving some production work to countries where labor costs are lower.

Many fabricating, assembling, and handworking occupations are sensitive to fluctuations in business conditions. As factory orders decline during economic downturns, workers may experience shortened workweeks, layoffs, and plant closings. Workers employed in motor vehicle and other durable goods manufacturing or in industries that produce construction and building materials are especially affected by changes in business conditions. More information about job opportunities and job security appears in the statements that follow.

Precision Assemblers

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

When Henry Ford began producing automobiles on an assembly line, modern mass production was born. Workers who had previously built a complete automobile alone now found themselves specializing in just one part of the job. Production became a team effort, with each worker performing a single task on every car rolling by on the line.

Workers who put together the parts of manufactured articles are called assemblers. Sometimes hundreds of assemblers work on a single finished product. Assembly work varies from simple repetitive jobs that are relatively easy to learn to those requiring precision and many months of experience and training. It is this latter group that this statement describes.

The work of precision assemblers requires a high degree of accuracy. Workers must be able to interpret detailed specifications and instructions and apply independent judgment, as well as have the knowledge gained through experience and training. Some experienced assemblers work with engineers and technicians, assembling prototypes or test products. Precision assemblers involved in product development must know how to read blueprints and engineering specifications and how to use a variety of tools and precision measuring instruments.

Precision assemblers may work on subassemblies or the complete final assembly of finished products or components of products such as machinery, aircraft, or electronic equipment. For example, precision aircraft assemblers put together and install parts of airplanes such as wings or landing gear. Precision structural metal fitters align and fit structural metal parts according to blueprints prior to welding or riveting. Precision electromechanical equipment assemblers prepare and test equipment or devices such as dynamometers, ejection seat mechanisms, magnetic drums, and tape drives.

The manufacturing process is changing. Mass production has been the predominant approach in manufacturing since Henry Ford revolutionized the automobile industry, but another revolution is taking place. Flexible manufacturing systems (FMS), which include the manufacturing applications of robotics, computers, and various sensing technologies, are changing the way goods are made and affecting the jobs of those who make them. As manufacturing firms strive for greater productivity, jobs that can be performed more economically or more accurately by automated equipment will be restructured; many of them will disappear. Often, these are low-skilled and repetitive jobs. As in the case of automobile spray painting, they may be unpleasant or even hazardous.

Until now, very few precision assembly jobs have been eliminated by automation. The need for precision, independent judgment, and knowledge has placed such jobs beyond the capabilities of robots. However, with advances in robotics and in vision and touch sensing systems, precision assembly jobs have become candidates for automation. Prototype lines that are competely automated already exist. Because much precision assembly work is done in difficult-to-reach locations unsuited for robots, such as inside airplane fusilages or inside dishwasher chassis, replacement of these workers by automated processes will be slower and less complete than replacement of welders and painters. Also, some of the technology needed to automate precision assembly work is not expected to be widely available until after 1990. Nonetheless, a revolution in manufacturing technology is underway, and, by the turn of the century, many analysts expect assembly jobs to be very scarce.

Working Conditions

The conditions under which precision assemblers work depend on the industry in which they are employed. Electronics and watch assemblers sit at tables in rooms that are clean, well lighted, and free from dust. Assemblers of aircraft and industrial machinery, however, usually come in contact with oil and grease, and their working areas may be quite noisy. They may have to lift and fit heavy objects. Workers on assembly lines are under pressure to keep up with the speed of the lines. Since most assemblers only perform a few steps in the assembly process, assembly jobs tend to be monotonous.

Work schedules of assemblers may vary at plants with more than one shift. Workers can accept or reject a certain job on a given shift, usually in order of seniority.

Employment

Virtually all of the 353,000 precision assembler jobs in 1984 were in plants that manufacture durable goods. One out of three jobs involved assembly of electronic and electrical machinery, equipment, and supplies including electrical switches, welding equipment, electric motors, lighting equipment, household appliances, and radios and television sets. Nearly 1 job in 5 involved assembly of nonelectrical machinery (diesel engines, steam turbine generators, farm tractors, mining and construction machinery, computers, and window air-conditioners).

The following tabulation lists the industries that provided most wage and salary jobs for precision assemblers in 1984:

	Percent
Total	100
Electrical and electronic machinery and equipment	41
Machinery, except electrical	28
Transportation equipment	14
Professional and scientific instruments	10
Fabricated metal products	5

Training, Other Qualifications, and Advancement

Precision assemblers often are promoted from the ranks of workers in less skilled jobs in the same firm. Sometimes, outside applicants may be hired if they possess suitable experience. The ability to do accurate work at a fast pace is a key job requirement. A high school diploma is helpful but usually is not required.

For some precision assembly jobs, applicants may need special training. For example, employers may require that applicants for electrical or electronic assembler jobs be technical school graduates or have equivalent military training.

Good eyesight, with or without glasses, may be required for assemblers who work with small parts. In plants that make electrical and electronic products, which may contain many different colored wires, applicants often are tested for color blindness.

As precision assemblers become more experienced, they may progress to jobs that require more skill and be given more responsibility. Experienced assemblers who have learned many assembly operations and understand the construction of a product may become product repairers. These workers fix assembled articles that inspectors have identified as defective. Assemblers also may advance to inspector or be promoted to supervisor. In some firms, assemblers can become trainees for one of the skilled trades.

Job Outlook

Employment of precision assemblers is expected to grow about as fast as the average for all occupations through the mid-1990's. In the unlikely event that flexible manufacturing systems come into widespread use before then, there would be fewer new jobs. Nonetheless, replacement needs, not employment growth, will be the principal factor influencing job prospects for precision assemblers. This is such a large occupation that the need to replace workers who retire or leave the occupation for other reasons generates a substantial number of job openings.

As in the past, job opportunities will vary with the fortunes of the industries employing precision assemblers, and prospects will be best in industries that are at a competitive advantage. Currently, precision assembly jobs are being lost to "outsourcing"—the practice of moving assembly operations to countries where labor is cheaper. This trend is expected to continue. Over the next 10 years, outsourcing of assembly work may well cost more jobs than robots or automated manufacturing systems, the full impact of which will not be felt so soon.

Being able to do accurate work at a fast pace is important for precision assemblers.

The effect of automation on precision assembler employment will depend on how rapidly and extensively new manufacturing technologies are adopted. Certainly, not all precision assemblers can be replaced efficiently by automated processes. Robots are expensive and a large volume of work is required to justify their purchase. They may not be economical in small operations with perhaps only one shift per day. Also, where the assembly parts involved are small or irregular in size, robot technology is only now beginning to make inroads. Robot assembly works best where products are designed specifically to be assembled by robots. Often, manufacturers are unwilling to invest in product and equipment redesign as long as existing operations are profitable.

The diffusion of flexible manufacturing systems will affect some industries sooner than others. Electrical and electronic assembly jobs are expected to be among the first jobs adversely affected. These jobs are found in the motor vehicle, electronics, communications, and computer manufacturing industries. Machine builders and other precision machine assemblers are likely to be among the last to be affected.

Assemblers' employment opportunities will vary geographically. Areas of industrial expansion such as the sunbelt States are likely to provide the best prospects.

Earnings

The median earnings for all assemblers working full time were about $291 a week in 1984. Precision assemblers typically earn 5 to 10 percent more than entry level assemblers.

Wage rates for precision assemblers working under union contracts ranged from about $8.50 to $15 an hour in 1984, according to limited information. Starting workers earned wages around the lower rate and, after 2 years, typically earned about $10 to $13 an hour. Some highly skilled assemblers, such as certain aircraft assemblers, earned $15 an hour or more. Some assemblers are paid incentive or piecework rates, and, therefore, can earn more by working faster.

Many assemblers are members of labor unions. These unions include the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; the United Automobile, Aerospace and Agricultural Implement Workers of America; the International Brotherhood of Electrical Workers; and the United Steelworkers.

Related Occupations

Other occupations which involve operating machines and tools and assembling things are welders, ophthalmic laboratory technicians, and operators of drill presses, laminating machines, and riveting machines.

Sources of Additional Information

Information about employment opportunities for assemblers is available from local offices of the State employment service.

Transportation Equipment Painters

(D.O.T. 845.381)

Nature of the Work

Automobiles, trucks, buses, and aircraft are painted to prevent corrosion, enhance their appearance, and—in the case of those used commercially—advertise the business of their owners. The vivid color schemes decorating aircraft and the multicolored logos on the sides of tractor-trailers are the product of transportation equipment painters, but their work is most familiar to us as the deep finish of a new or restored automobile.

Manufacturers employ many transportation equipment painters to apply the finish to new motor vehicles, aircraft, and other transportation equipment, but the majority work as automotive painters for body repair and paint shops across the Nation. Automotive painters make old and damaged motor vehicles "look like new." These skilled workers repaint older automobiles, trucks, and buses that have lost the luster of their original paint and make fender and body repairs almost invisible.

When painting only the repaired portions of a vehicle, automotive painters often have to mix paint to match the original color, which can be very difficult if the color has faded. To prepare a vehicle for painting, painters or their helpers use power sanders and sandpaper to remove the original paint or rust, and fill small nicks and scratches with body putty. They also remove or mask parts they do not want painted, such as chrome trim, headlights, windows, and mirrors.

Automotive painters use a spray gun to apply several primer coats. They apply lacquer or, in most cases, enamel primers to vehicles with metal bodies and flexible primers to newer vehicles with plastic body parts. They select the spray-gun nozzle best suited to the kind of paint being used and, if necessary, they adjust the air-pressure regulator to obtain the correct pressure. If the incorrect nozzle is used or if it is not adjusted properly, paint may run or go on too thinly. To speed drying, they may place the freshly painted vehicle under heat lamps or in a special infrared oven. After each coat of primer dries, they sand the surface to remove any irregularities and to help the next coat adhere better. Final sanding of the primers may be done by hand with a fine grade of sandpaper. A sealer is then applied and allowed to dry, followed by the final topcoat. When lacquer is used, painters or their helpers usually polish the finished surface after the final coat has dried; enamel dries to a high gloss and usually is not polished.

Transportation equipment production painters, who work for manufacturers of automobiles, trucks, and other transportation equipment, generally work on assembly lines. Most production painters use spray guns, but their skills are different from automotive painters, who repair damaged cars in body and paint repair shops. Production painters usually do not have to prepare the surface for painting because the equipment is new and unpainted. On assembly lines, mixing the paint and monitoring its consistency are usually the responsibilities of technicians, but production painters may have this responsibility when the equipment is custom made, as aircraft usually are. If the equipment is to be multicolored, painters apply masking to keep colors from overlapping.

Motor vehicle assembly lines are increasingly using painting robots and other types of automatic painting machinery that require fewer production painters. Production painters are still needed to check for imperfections in the work of the machines and to touch up sections missed or not reached by the machines. Painters also may be responsible for setting up the machinery at the beginning of the shift, keeping it running, and cleaning it at the end of the shift.

Working Conditions

Transportation equipment painters work indoors and may be exposed to dangerous fumes from paint and paint-mixing ingredients. However, most painters wear masks or respirators which cover the nose and mouth, and painting is usually done in special ventilated booths that protect the painters from these hazards. Painters have to stand for long periods of time. To reach all parts of the equipment, they may have to bend, stoop, or crouch in uncomfortable positions.

Employment

Transportation equipment painters held about 60,000 jobs in 1984. The majority were automotive painters. Of these, two-thirds worked in shops that specialize in automotive repairs. Most others worked in the repair shops of automobile and truck dealers. Some automotive painters worked for organizations that maintain and repair their own fleets of motor vehicles, such as trucking companies and buslines.

Transportation equipment production painter jobs were concentrated in the motor vehicle manufacturing industry. Others worked for manufacturers of aircraft, ships, bicycles, and other equipment.

Automotive painters are employed throughout the country, but production painters are concentrated in industralized areas.

Training, Other Qualifications, and Advancement

Most automotive painters start as helpers and gain their skills informally by working with experienced painters. Beginning helpers usually remove trim, clean and sand surfaces to be painted, mask surfaces that they do not want painted, and polish finished work. As helpers gain experience, they progress to more complicated tasks, such as mixing paint to achieve a good match and using spray guns to apply primer coats or final coats to small areas. Becoming skilled in all aspects of automotive painting usually requires 3 to 4 years of on-the-job training.

Instructional programs in automotive painting are offered at a growing number of community and junior colleges and vocational and technical schools. Completion of such a program enhances one's employment opportunities and can speed promotion to the journeyman level. The quality of formal automotive painting programs varies greatly, however. Better programs provide a thorough background in the latest automotive painting technology, such as the use of acrylic paints, and include substantial practical experience essential to becoming proficient as an automotive painter.

Production painters acquire their skills on the job, usually by watching and helping experienced painters. Training lasts from a few days to several months.

Painters should have good health, keen eyesight, and a good color sense. Courses in automobile-body repair offered by high schools, vocational schools, and community colleges are helpful. Completion of high school generally is not required but usually is an advantage.

Voluntary certification by the National Institute for Automotive Service Excellence is recognized as the standard of achievement for automotive painters. For certification, painters must pass a written examination and have at least 2 years of experience in the field. High school, trade or vocational school, or community or junior college training in automotive painting and refinishing may substitute for up to 1 year of experience. To retain certification, painters must retake the examination at least every 5 years.

Transportation equipment painters remove or mask parts that are not to be painted, and then use a spray gun to apply paint.

Experienced transportation equipment painters with leadership ability may advance to supervisor jobs. Some automotive painters open their own shops.

Job Outlook

Employment of transportation equipment painters is expected to grow about as fast as the average for all occupations through the mid-1990's. The number of new jobs for automotive painters should grow as the number of cars, trucks, and buses damaged in traffic accidents increases with the motor vehicle population. Continuing emphasis on building lighter weight cars that achieve high gasoline mileage, but which are prone to greater damage in collisions, is also expected to contribute to growth of automotive painters. In addition, they also will be needed to repaint older vehicles which have rust or faded paint. Jobs for production painters, on the other hand, will decline as motor vehicle manufacturers increasingly automate their painting.

Most job openings for transportation equipment painters are expected to arise as experienced painters transfer to other occupations, retire, or stop working for other reasons. Job opportunities will be best in heavily populated areas.

Experienced automotive painters can expect relatively steady work because the automotive painting business is not significantly affected by changes in economic conditions. Regardless of the state of the economy, automobiles damaged in accidents require repair and refinishing. However, there may be fewer openings for persons seeking to enter this occupation during recessions.

Most production painters work in plants that produce automobiles and trucks. During recessions, purchases of new motor vehicles are often put off, causing employment in these plants to be very sensitive to economic conditions. Production painters may be laid off when unsold vehicles accumulate.

Earnings

Experienced automotive painters employed by automobile dealers in 24 large metropolitan areas had estimated average hourly earnings of $13.57 in 1984. Their average hourly earnings were highest in the Eastern and Midwestern States and lowest in the Southern and Northeastern States.

Experienced production painters employed in motor vehicle manufacturing averaged $12.69 an hour in 1984.

Beginning automotive painter apprentices usually start at about half the hourly rate of fully qualified painters. As they progress, their wages gradually approach those of experienced automotive painters. Helpers start at lower wage rates.

Many automotive painters employed by automobile dealers and independent repair shops receive a commission based on the labor cost charged to the customer. Under this method, earnings depend largely on the amount of work a painter does and how fast it is completed. Employers frequently guarantee commissioned painters a minimum weekly salary. Helpers and apprentices usually receive an hourly rate until they become sufficiently skilled to work on a commission basis. Trucking companies, buslines, and other organizations that repair their own vehicles usually pay by the hour. Most painters work 40 hours a week.

Many transportation equipment painters belong to unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Most union painters work for transportation equipment manufacturers, the larger automobile dealers, trucking companies, and buslines.

Related Occupations

Restoring damaged motor vehicles often involves repair of their bodies and mechanical components as well as painting. Transportation equipment painters often work closely with the following related automotive service occupations: Automotive repair service estimators, automotive body repairers and customizers, automotive mechanics, and diesel mechanics.

Sources of Additional Information

For more details about work opportunities, contact transportation equipment manufacturers and local automotive-body repair shops and automotive dealers; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may be a source of information about job opportunities and training programs.

For general information about a career as an automotive painter, write to:

Automotive Service Industry Association, 444 North Michigan Ave., Chicago, Ill. 60611.

Automotive Service Councils, Inc., 188 Industrial Dr., Suite 112, Elmhurst, Ill. 60126.

Information on how to become a certified automotive painter is available from:

National Institute for Automotive Service Excellence, 1825 K St. NW., Suite 515, Washington, D.C. 20006.

Welders and Cutters

(D.O.T. 553.684-010; 613.667-010; 709.684-086; 727.684-022, 810.384-010, -014, .664-010, 684-010; 811.684-010, -014; 813.684-010; 816-364-010, .464-010, .684-010; 819.281-010, -014, -022, .361-010, -014, .381-010; .384-008, -010; and .684-010)

Nature of the Work

Welding is the most common way of permanently joining metal parts. Typically, heat is applied to the metal pieces to be joined, melting the parts and fusing them to form a permanent bond. Because of its strength, welding is used to construct and repair parts of ships, automobiles, spacecraft, and thousands of other products. Welding is also used to join beams and steel reinforcing rods in buildings, bridges, and highways.

There are three common ways to create the heat that is applied to the parts being joined. In electric arc welding, the most frequently used process, heat is created as electric current flows through an arc between the tip of the welding electrode and the metal. In resistance welding, heat is created in the weld metal as current flows through the metal. In gas welding, the flame from the combustion of burning gases melts the metal. In arc and gas welding, filler materials, called welding electrodes or welding rods, are melted and added to the weld puddle to fill the joint, giving it greater strength. The welder controls the amount of heat and the size of the melted area and adds the proper amount of filler material to form a strong joint.

Welding processes differ, and the equipment and skill levels of welders vary. Some welding operations require highly skilled manual welders who can use gas and electric arc welding equipment in a variety of positions and who are able to plan their work from drawings or specifications. Skilled welders know the characteristics and properties of steel, aluminum, and other commonly used metals. Examples of skilled welders are maintenance welders; pressure vessel welders, such as those working on submarines or nuclear reactors; pipe welders; and welders who construct ships and bridges.

In ship construction, welders join the steel plates, beams, and pipes. Some joints to be welded are on the floor (deck), some are on the walls, and some are overhead. Each must be carefully welded to insure that the ship will not break apart in rough seas.

Ship welders generally use manual arc welding equipment, although semiautomatic equipment is becoming more widely used. After welders read instructions regarding which materials and welding method to use, they obtain supplies from the storage area. To form a joint by arc welding, they use an electrode attached to an electrical cable coming from a welding power supply. Another cable is attached to the metal being welded. Thus, electricity will flow through the welding electrode, through the arc to the metal being welded, and back to the power supply. The power supply can be adjusted to provide the correct amount of current. When the power is turned on, welders "strike an arc" by briefly touching the electrode to the metal to start the electricity flowing and then pulling the rod back to form a small arc gap through which the current must flow. If the distance between the electrode and the metal is correct, a stable electric arc will bridge the space; the heat from the arc melts the electrode and the metal. Welders move the arc along the length of the joint. As the electrode melts and becomes shorter, they move the holder closer to the metal to keep the right distance from the arc. They replace very short electrodes with new ones.

Maintenance welders repair tools, machines, and equipment. Often they bring portable gas torches, hoses, and tanks to the job because electricity may not be available.

When working on a broken pipe, for example, maintenance welders examine the pipe and prepare the break for repair. They then select a welding filler rod appropriate for the job. Next, they light the torch and adjust regulators on the cylinders of fuel gas, such as acetylene, and oxygen to obtain the right gas mixtures and flame. Then they heat the edges of the break with the torch. As the metal begins to soften, welders melt the end of the filler rod in the hot liquid metal as they carefully move the torch and rod along the break. Welders must keep the torch the correct distance from the metal, apply heat correctly, and use appropriate filler material to repair the break.

In factories where many identical parts need to be welded, automatic arc, electron beam, or resistance welding machines are used. Workers who operate such machines to weld automobile mufflers and washing machines, for example, need little knowledge of welding. These workers, frequently called welding machine operators, do not need the skills required of welders and cutters. Their work is not covered in this statement.

The work of arc and flame cutters is closely related to that of welders. Using heat from burning gases or an electric arc, cutters cut and trim rather than join metal. Some electrically and mechanically operated machines follow guidelines automatically.

Working Conditions

Welders frequently are exposed to potential hazards. They use protective clothing, safety shoes, goggles, helmets with protective lenses, and other devices to prevent burns and eye injuries. Although lighting and ventilation usually are adequate, some metals give off toxic gases and fumes as they melt. Workers often are in contact with rust, grease, and dirt on metal surfaces. A face shield or goggles generally are adequate protection. Skilled welders may be isolated for short intervals while they work in booths constructed to contain sparks and glare.

Employment

Welders and cutters held about 308,000 jobs in 1984. Two out of three jobs involved the manufacture of durable goods including boilers, bulldozers, trucks, and ships, and consumer appliances such as refrigerators. Most of the remaining jobs were in metal products repair or in construction of bridges, large buildings, and pipelines.

Training, Other Qualifications, and Advancement

Although it takes several years of on-the-job training to become a skilled welder, less skilled work can be learned in a few months or less.

High schools, vocational-technical institutes, and community colleges throughout the country teach entry level welding skills. Private vocational schools also teach welding, in courses that take from 6 months to 1 year to complete. The Armed Forces operate welding schools as well. Many welders learn their craft through informal, on-the-job instruction while they work as welders' helpers. Some transportation equipment manufacturers provide after-hours classes to enable company employees to qualify for welding jobs when openings occur. Other company-run welding schools teach advanced techniques to qualify welders for work on critical applications such as nuclear reactors or high-pressure boilers.

Persons considering work as welders or cutters need manual dexterity, good eyesight, and good eye-hand coordination. They should have the ability to concentrate on detailed work for long periods and be physically able, in order to bend, stoop, and work in awkward positions. Most employers prefer applicants who have high school or vocational school training in welding. Courses in shop mathematics, mechanical drawing, blueprint reading, physics, and chemistry also are helpful.

Before working on aircraft, buildings, bridges, pipelines, and other jobs where the strength of the weld is highly critical, welders may have to pass an examination given by an employer or government agency to become "certified welders."

Skilled welders may be promoted to welding inspectors, technicians, or supervisors. Experienced workers who have obtained college training are in great demand as welding engineers to develop new applications for welding. A small number of experienced welders open their own repair shops.

Job Outlook

Employment of welders is expected to increase as fast as the average for all occupations through the mid-1990's. A larger, more affluent population is expected to stimulate demand for the thousands of products that welders help make. The rate of expansion in durable goods industries will largely determine the number of new jobs for welders. Most openings, however, will arise because of the need to replace experienced welders who transfer to other occupations or retire.

Greater use of composite materials and plastics will mean fewer jobs for welders.

Welders and cutters are vulnerable to periodic layoffs for factory retooling, and to economic downturns. Thus, although many openings for welders are expected through the mid-1990's, those seeking a first job in a community affected by a downturn may encounter competition from experienced welders who are not working. Job openings are expected to vary geographically; the best prospects will be in the Sunbelt and the western States. Those who have recently completed vocational training programs in welding will fill some openings, although graduates of these programs don't always become welders. Welding skills are applicable in many occupations.

Technological change will affect demand for welders through the mid-1990's and beyond. Advances in robotics, visual and other machine-sensing capabilities, and computer-aided manufacturing are transforming the production process and may eventually lead to a very sharp decline in the number of production welding jobs. The jobs of highly skilled welders should not be adversely affected by automation much before the mid- to late 1990's however, reflecting the time it will take to implement new manufacturing technologies on a wide scale.

Robot welding systems are already eliminating the jobs of spot welders in the auto industry. New auto assembly plants are highly automated and require few welders. As more and more assembly plants are modernized, jobs for spot welders in the auto industry will all but disappear. Widespread application of robotic arc welding in other durable goods industries is not expected until the late 1990's, but, when that occurs, demand for arc welders may decline precipitously.

Another technological change on the horizon is the use of high-strength composite materials and improved plastics in place of metal in a wide range of products—from automobiles and trucks to home appliances. As the use of substitutes for metal becomes widespread, fewer welds will be needed, and demand for production welders will fall accordingly.

Earnings

The limited wage data available indicate that production welders earned from $10 to $14 an hour in 1984. Welders in the construction industry earned $12 to $14 an hour, depending on location.

Welders belong to many different unions. Among these are the International Association of Machinists and Aerospace Workers; the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada; and the United Electrical, Radio and Machine Workers of America.

Related Occupations

Welders are highly skilled workers who must be very familiar with the properties of metal and who use hand-held equipment or machines to do their work. Others with similar duties are blacksmiths, forge shop workers, all-round machinists, machine tool operators, tool-and-die makers, millwrights, sheet-metal workers, boilermakers, and metal sculptors.

Sources of Additional Information

A list of postsecondary programs in welding and cutting, arranged by city and State, may be found in *Postsecondary Schools with Occupational Programs, 1982*, a publication of the U.S. Department of Education's National Center for Education Statistics. This publication may be available in counseling centers and large public libraries.

For information on training opportunities and jobs for welders in your community, contact local employers or the local office of the State employment service.

A one-page brochure on welding is available free from:

The American Welding Society, 550 NW., LeJeune Rd., Miami, Fla. 33126.

Transportation and Material Moving Occupations

The majority of people in transportation and material moving occupations operate transportation equipment such as trucks, buses, taxicabs, trains, ships, and aircraft. Others operate industrial material moving equipment such as cranes, power shovels, graders, and industrial trucks. Although these occupations are found in all industries, they are concentrated in the transportation industry.

Most employers prefer high school graduates for these jobs, but persons who have not completed high school are often hired if they meet all other qualifications. For some occupations, vocational or technical training or some college education is an advantage. The ability to understand and follow complex operating rules, procedures, and instructions is an important requirement for most of these jobs. Busdrivers, for example, must adhere to detailed schedules, routes, and operating procedures, and aircraft pilots must painstakingly follow complex checkout instructions before takeoff to insure that their craft is in proper operating condition. During operation, they follow procedures to insure the safety of lives and property.

Although work in these occupations generally is not strenuous, it often is tedious or stressful. Coordination and manual dexterity are vital. Some mechanical aptitude is needed to recognize what parts of a vehicle, bulldozer, or industrial truck are not operating properly. For many workers in these occupations, such as taxicab drivers, the efficiency with which they perform their work directly affects their earnings.

Good vision, usually with or without glasses, and ability to judge distances are basic requirements for transportation and material moving occupations. Good color perception is also required for many of these jobs. Regular physical examinations are required for most jobs to insure that individuals have not developed chronic medical conditions that could adversely affect their performance. Good health is vital in order to handle stress for prolonged periods of time, whether driving a taxicab through city traffic all day or operating a crane at a high-rise construction site where a misjudgment of distance could injure fellow workers or passersby.

Many transportation and material moving occupations are closely regulated. Most motor vehicle operators need a chauffeur's license and frequently must adhere to extensive regulations. Special operating certificates are also needed to be employed as an aircraft pilot or a merchant marine officer.

More detailed information on selected transportation and material moving occupations appears in the statements that follow.

Aircraft Pilots

(D.O.T. 196 except .163; and 621.261-018)

Nature of the Work

Pilots are skilled, highly trained professionals who fly airplanes and helicopters to carry out a wide variety of tasks. Most pilots transport passengers, cargo, and mail, while others dust crops, spread seed for reforestation, test aircraft, and take photographs. Helicopter pilots are involved in firefighting, police work, offshore exploration for natural resources, evacuation and rescue efforts, logging operations, construction work, and weather station operations.

Except on small aircraft, two pilots usually make up the cockpit crew. Generally, the most experienced pilot (called captain) is in command and supervises all other crew members. The copilot or first officer assists in communicating with air traffic controllers, monitoring the instruments, and flying the aircraft. Most large aircraft have a third pilot in the cockpit—the flight engineer or second officer—who assists the other pilots by monitoring and operating many of the instruments and systems, making minor inflight repairs, and watching for other aircraft. New technology can perform many flight tasks, however, and many aircraft are now designed to fly with only two pilots.

Before departure, pilots plan their flights carefully. They confer with dispatchers and weather forecasters to find out about weather conditions enroute and at their destination. Based on this information, they choose a route, altitude, and speed that should provide the fastest, safest, and smoothest flight. When flying under instrument flight rules, the pilot in command must file an instrument flight plan with air traffic control so that the flight can be coordinated with other air traffic.

Before taking off, pilots thoroughly check their planes to make sure that the engines, controls, instruments, and other systems are functioning properly. They also make sure that baggage or cargo has been loaded correctly.

Takeoff and landing are the most difficult and dangerous parts of the flight and require close coordination between the pilot and copilot. For example, as the plane accelerates for takeoff, the pilot concentrates on the runway while the copilot scans the instrument panel. To calculate the speed they must attain to become airborne, pilots consider the altitude of the airport, outside temperature, weight of the plane, and the speed and direction of the wind. The moment the plane reaches takeoff speed, the copilot informs the pilot, who then pulls back on the controls to raise the nose of the plane.

Unless the weather is bad, the actual flight is relatively easy. Pilots steer the plane along their planned route and are monitored by the air traffic control stations they pass along the way. They continuously scan the instrument panel to check their fuel supply and the condition of their engines. Pilots may request a change in altitude or route if circumstances dictate. For example, if the ride is rougher than expected, they may ask air traffic control if pilots flying at other altitudes have reported better conditions. If so, they may request a change. This procedure also may be used to find a stronger tailwind or a weaker headwind to save fuel and increase speed.

If visibility is poor, pilots must rely completely on their instruments. Using the altimeter readings, they know how high above ground they are and can fly safely over mountains and other obstacles. Special navigation radios give pilots precise information which, with the help of special maps, tells them their exact position. Other very sophisticated equipment provides directions to a point just above the end of a runway and enables pilots to land completely "blind."

Once on the ground, pilots must complete records on their flight for their company and the Federal Aviation Administration (FAA).

Airline pilots have the services of large support staffs and consequently perform few nonflying duties. Pilots employed by businesses that use their own aircraft, however, usually are the businesses' only experts on flying and, consequently, have many other duties. They may load the plane, handle all passenger luggage to insure a balanced load, and supervise refueling. Other nonflying responsibilities include keeping records, scheduling flights, arranging for major maintenance, and performing minor maintenance and repair work on their planes.

Some pilots are instructors. They teach their students the principles of flight in ground-school classes and demonstrate how to operate aircraft in dual-controlled planes.

A few specially trained pilots employed by the airlines are "examiners" or "check pilots." They periodically fly with each airline pilot and copilot to make sure that they are proficient.

Working Conditions

By law, airline pilots cannot fly more than 100 hours a month or more than 1,000 hours a year. Most airline pilots fly an average of 80 hours a month and work an additional 80 hours a month performing nonflying duties. The majority of flights involve layovers away from home. When pilots are away from home, the airlines provide hotel accommodations and an allowance for expenses. Airlines operate flights at all hours of the day and night, so work schedules often are irregular.

Pilots employed outside the airlines often have irregular schedules; they may fly 30 hours one month and 90 hours the next. Since these pilots frequently have many nonflying responsibilities, they have much less free time than airline pilots. Except for business pilots, most pilots employed outside the airlines do not remain away from home overnight. They may work odd hours, however. Instructors, for example, often give lessons at night or on weekends.

Airline pilots, especially those on international routes, often suffer jet lag—disorientation and fatigue caused by many hours of flying through different time zones. The work of test pilots, who check the flight performance of new and experimental planes, may be dangerous. Pilots who are crop dusters may be exposed to toxic chemicals and often do not have the benefit of a regular landing strip. Helicopter pilots involved in firefighting or police work are particularly subject to personal injury.

Although flying does not involve much physical effort, the mental stress of being responsible for a safe flight, no matter what the weather, can be tiring. Particularly during takeoff and landing, pilots must be alert and quick to react if something goes wrong.

Employment

Civilian pilots held about 79,000 jobs in 1984. Three-fifths worked for the airlines. Many others worked as flight instructors at local airports or for large businesses that use their own airplanes or helicopters to fly company cargo and executives. Some pilots flew small planes for air taxi companies, usually to or from lightly traveled airports not serviced by the airlines. Others worked for a variety of businesses performing tasks such as crop dusting, inspecting pipelines, or conducting sightseeing trips. Federal, State, and local governments also employed pilots. Several thousand pilots were self-employed.

Earnings of aircraft pilots are among the highest in the Nation.

Training, Other Qualifications, and Advancement

All pilots who are paid to transport passengers or cargo must have a commercial pilot's license issued by FAA. Helicopter pilots must hold a commercial pilot's certificate with a helicopter rating. To qualify for these licenses, applicants must be at least 18 years old and have at least 250 hours or more of flight experience. They also must pass a strict physical examination to make sure that they are in good health and have 20/20 vision with or without glasses, good hearing, and no physical handicaps that could impair their performance. Applicants must pass a written test that includes questions on the principles of safe flight, navigation techniques, and FAA regulations. They also must demonstrate their flying ability to FAA examiners.

In addition to a commercial license, pilots who have to fly in bad weather must be licensed by the FAA to fly by instruments. Pilots may qualify for this license by having 40 hours of experience flying by instruments, passing a written examination on procedures and FAA regulations covering instrument flying, and demonstrating their ability to fly by instruments.

Airline pilots must fulfill additional requirements. They must pass FAA written and flight examinations to earn a flight engineer's license. Captains must have an airline transport pilot's license. Applicants for this license must be at least 23 years old and have a minimum of 1,500 hours of flying experience including night and instrument flying.

All licenses are valid as long as a pilot can pass the periodic physical examinations and tests of flying skills required by Government and company regulations.

Flying can be learned in military or civilian flying schools. Either kind of training satisfies the flight experience requirements for licensing. The FAA has certified about 1,225 civilian flying schools, including some colleges and universities that offer degree credit for pilot training. Military pilots gain substantial experience on jet aircraft and helicopters, which airlines and many businesses prefer. Having lost many pilots to the airlines in recent years, the Armed Forces are offering financial incentives to curb the high rate of attrition. More pilots are expected to stay in military flying, forcing the airlines to hire a higher percent of general aviation pilots.

Pilots hired by airlines must be high school graduates; however, most airlines require 2 years of college and prefer to hire college graduates. In fact, most entrants to this occupation have a college degree. Because pilots must be able to make quick decisions and accurate judgments under pressure, airline companies reject applicants who do not pass required psychological tests.

New airline pilots usually start as flight engineers. Although airlines favor applicants who already have a flight engineer's license, they may train those who have only the commercial license. All new pilots receive several weeks of intensive training in simulators and classrooms before being assigned to a flight.

Companies other than airlines generally do not require as much flying experience. However, a commercial pilot's license is required, and companies prefer applicants who have experience in the type of plane they will be flying. New employees generally start as copilots. Test pilots often are required to have an engineering degree.

Most helicopter pilots are trained in the military. Military pilots only have to pass the FAA 'military competency' examination in order to be licensed as a commercial helicopter pilot. Because of insurance requirements, most commercial companies require that helicopter pilots have 1,500 hours of flying time. If a pilot does not accumulate that time flying in the military, it is difficult to get a job in the commercial sector.

Advancement for all pilots generally is limited to other flying jobs. Many pilots start as flight instructors, building up their flying hours while they earn money teaching. As they become more experienced, these pilots occasionally fly charter planes and perhaps get jobs with small air transportation firms, such as air taxi companies. Some advance to business flying jobs. A small number get flight engineer jobs with the airlines.

In the airlines, advancement usually depends on seniority provisions of union contracts. After 5 to 10 years, flight engineers advance according to seniority to copilot and, after 10 to 20 years, to captain. Seniority also determines which pilots get the more desirable routes. In a nonairline job, a copilot may advance to pilot and, in large companies, to chief pilot in charge of aircraft scheduling, maintenance, and flight procedures.

Job Outlook

Employment of pilots is expected to increase faster than the average for all occupations through the mid-1990's. While computerized flight engineering systems may reduce the demand for flight engineers, the expected growth in airline passenger and cargo traffic will create a need for more aircraft, more pilots, and more flight instructors. Businesses are expected to operate more planes and employ more pilots to fly passengers and cargo to the increased number of locations that the scheduled airlines do not service.

In the past, competition for job openings has been keen because the number of qualified pilots seeking jobs has exceeded the number of openings. Currently, the job outlook is favorable because of the recent surge in the number of new aircraft and in the rate of retirement among pilots. It is uncertain how long these trends will continue. However, since flying is an attractive, high-paying occupation, more applicants than openings are expected in the long run.

Because wages generally are lower outside the airlines, there usually is not as much competition for these jobs. College graduates who have experience flying jet aircraft and who have a commercial pilot's license and a flight engineer's license can expect first consideration for jobs with the major airlines.

Aircraft pilots understandably have a strong attachment to their occupation since it requires a substantial investment in specialized training and offers very high earnings. A relatively small proportion of pilots leave the occupation each year. Nevertheless, most job openings are expected to result from the need to replace pilots who retire or stop working for other reasons.

Employment of pilots is sensitive to cyclical swings in the economy. During slow periods, when a decline in the demand for air travel forces airlines to curtail the number of flights, airlines may furlough some pilots. Commercial and corporate flying, flight instruction, and testing of new aircraft also decline during recessions, adversely affecting pilots employed in those areas.

Earnings

Earnings of airline pilots are among the highest in the Nation. In 1984, the average salary for airline pilots was about $80,000 a year, while some senior captains on the largest aircraft earned as much as $130,000. Starting salaries for flight engineers averaged about $16,000 a year. Earnings depend on factors such as the type, size, and maximum speed of the plane, and the number of hours and miles flown. Extra pay is given for night and international flights.

Generally, pilots working outside the airlines earn lower salaries. According to a survey conducted by the National Business Aircraft Association, average salaries for chief pilots ranged from about $39,000 to $56,000 a year in 1984; for captains/pilots, $36,000 to $46,000 a year; and for copilots, $29,000 to $39,000 a year. Usually, pilots who fly jet aircraft earn higher salaries than nonjet pilots.

Airline pilots generally are eligible for life and health insurance plans financed by the airlines. They also receive retirement benefits and, if they fail the FAA physical examination, disability payments. Some airlines provide allowances to pilots for purchasing and cleaning their uniforms. As an additional benefit, pilots and their immediate families usually are entitled to reduced fare transportation on their own and other airlines.

Most airline pilots are members of the International Airline Pilots Association.

Related Occupations

Although they are not in the cockpit, air traffic controllers and dispatchers also play an important role in making sure flights are safe and on schedule, and participate in many of the decisions pilots must make.

Sources of Additional Information

Information about job opportunities in a particular airline, and the qualifications required, may be obtained by writing to the personnel manager of the airline. Addresses of airline companies are available from:

Air Transport Association of America. 1709 New York Ave. NW., Washington, D.C. 20006.

For information on airline pilots, contact:

International Airline Pilots Association, 1625 Massachusetts Ave. NW., Washington, D.C. 20036.

For information about the duties as well as the physical and educational requirements for airline pilots and flight engineers, request *Pilots and Flight Engineers*, publication GA-300-122 (include a self-addressed mailing label), from:

U.S. Government Printing Office, Library and Statutory Distribution Service, 5208 Eisenhower Ave., Alexandria, Va. 22304.

For a copy of *List of Certificated Pilot Schools*, write to:

Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

For information about job opportunities, contact:

Future Aviation Professionals of America, 4291 J. Memorial Dr., Decatur, Ga. 30032. (This organization may be called toll free at 800-JET-JOBS.)

For information about job opportunities in companies other than airlines, consult the classified section of aviation trade magazines and apply to companies that operate aircraft at local airports.

Busdrivers

(D.O.T. 909.663; 913.363, .463-010, and .663-014)

Nature of the Work

Busdrivers provide transportation for millions of Americans every day. Intercity busdrivers operate buses that enable the public to travel between communities and metropolitan areas. Local transit busdrivers provide public transportation within a metropolitan area. School busdrivers transport pupils to and from schools. They follow definite time schedules and routes over highways and city and suburban streets to provide passengers with an alternative to the automobile and other forms of transportation.

The workday for busdrivers begins when they report to their assigned terminal or garage. At the garage, intercity and local transit busdrivers are given tickets, transfers, and refund and trip report forms. Drivers may check their vehicle's tires, brakes, windshield wipers, lights, oil, fuel, and water, and make certain that their buses are carrying safety equipment, such as fire extinguishers, first aid kits, and emergency reflectors. They then drive or ride as a passenger to the start of their runs.

On most runs, drivers pick up and discharge passengers at bus stops or stations. As passengers board the bus, intercity and local transit busdrivers collect the correct cash fare, token, or ticket or make sure that a valid pass is presented. They also collect and issue transfers. Drivers often answer questions about schedules, routes, and transfer points and sometimes announce stops and other information concerning trips.

Busdrivers' days are run by the clock, as they must pay special attention to their complicated schedules. Although drivers may run late when traffic is heavier than average, they do not let light traffic put them ahead of schedule so that they miss passengers.

Busdrivers must always be alert to prevent accidents, especially when driving in traffic or under adverse road and weather conditions. School busdrivers must exercise particular caution when children are boarding or leaving the bus. Busdrivers must operate the bus at safe speeds while trying to keep schedules. Since sudden stops or swerves jar standing passengers, drivers try to anticipate traffic developments, not react to them.

Drivers' routes vary. Local transit busdrivers may make several trips each day over the same city and suburban streets, stopping as frequently as every few blocks to pick up and discharge passengers. School busdrivers also drive the same routes each day, stopping frequently to pick up pupils in the morning and reversing direction in the afternoon to return them to their homes. School busdrivers occasionally transport students and teachers on field trips during the day, or athletes and students to games in the evening. Intercity busdrivers may make only a single one-way trip to a distant city or a round trip each day, stopping at stations at many small towns only a few miles apart or at large cities hundreds of miles apart. Drivers who operate chartered buses pick up a group of people, take them to the group's destination, and generally remain with them until they return. These trips frequently require drivers to remain away from home one night or more.

At the end of each day, busdrivers turn in trip reports with a record of tickets and fares received, trips made, and significant delays in schedule. As required by the U.S. Department of Transportation, intercity drivers keep a current record on each trip of the distances traveled and the periods of time they spend driving, performing other duties, and off duty. Busdrivers also turn in a report on the mechanical condition of their bus. In case of an accident, drivers must prepare a report describing exactly what happened and obtain the names, addresses, and phone numbers of persons on the bus and others involved in the accident.

Working Conditions

Driving a bus through heavy traffic while dealing with passengers is not physically strenuous, but it may cause nervous strain and fatigue. The busdriver is given a great deal of independence on the job and is solely responsible for the safety of the passengers and the bus. Many drivers like working without direct supervision and take pride in assuming these responsibilities. Some also enjoy the opportunity to meet the public.

Since intercity and transit buses operate at all hours every day of the year, drivers may work nights and weekends. New drivers work only when called and must be ready to report for work at any hour on very short notice. Driving schedules of intercity busdrivers may range from 6 to 10 hours a day and from 3 1/2 to 6 days a week. However, U.S. Department of Transportation regulations specify that intercity drivers shall not drive more than 10 hours without having at least 8 consecutive hours off and shall not drive after being on duty for 15 hours without at least 8 hours off duty.

School busdrivers work only when school is in session, having off weekends, holidays, and summers. The majority work 20 hours a week or less, driving one or two morning and afternoon routes and having the middle of the day free. Drivers taking field or athletic trips may work additional hours. Drivers who also have midday kindergarten routes may work as many as 30 hours a week.

Regular local transit busdrivers usually have a 5-day workweek; Saturdays and Sundays are counted as regular workdays. Some drivers work evenings and after midnight. To accommodate the demands of commuter travel, many local transit busdrivers work "split shifts." For example, a driver may work from 6 a.m. to 10 a.m., and then return to work from 3 p.m. to 7 p.m. Drivers may receive extra pay for working split shifts.

Employment

Busdrivers held about 459,000 jobs in 1984. About two-fifths of all busdrivers worked part time. Nearly 3 out of 4 busdrivers work for school systems or companies that provide school bus services under contract, as shown in the accompanying chart. Most of the remainder work for private and local government transit systems; intercity and charter buslines also employ many busdrivers.

Training, Other Qualifications, and Advancement

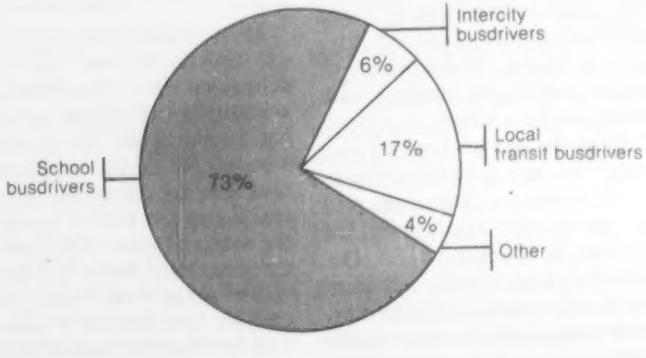
About 3 out of 4 persons entering busdriving take part-time jobs. Most have no more than a high school education. School busdriving provides few opportunities for full-time employment. In addition, many local transit and intercity busdrivers start on a part-time basis and are only able to increase their number of work hours as they acquire seniority. Half of all persons entering busdriving are students or homemakers and others reentering the labor force. Students and homemakers seeking to supplement family income are attracted to the large number of part-time busdriving jobs that allow them adequate time for other activities while employed.

Busdrivers' qualifications are established by State and Federal regulations. Most States require that drivers

Local transit busdrivers collect the correct cash fare or token from passengers.

Most busdrivers operate school buses.

Distribution of wage and salary employment, 1984



SOURCE: Bureau of Labor Statistics

have a chauffeur's license, which is a commercial driver's permit, or a special school bus license. In addition, intercity busdrivers must meet qualifications established by the U.S. Department of Transportation or a State agency, if the driver works only within one State.

Applicants for local transit and intercity busdriver positions should be at least 21 years old. School busdrivers must be at least 18 years old in most States, although a few States allow students as young as 16 to drive school buses. Busdrivers must be able to read, write, and speak English well enough to communicate with passengers and to complete reports. They should be in good health and have a good driving record. Busdrivers also must have at least 20/40 vision with or without glasses, good hearing, and normal use of their arms and legs. Many employers prefer applicants who have a high school education or its equivalent. Most employers require applicants to pass a physical examination and a written test of ability to follow complex bus schedules. In addition, intercity busdrivers must complete comprehensive written examinations which test their knowledge of Department of Transportation and State motor vehicle regulations, as well as a driving test in the type of bus they will operate.

Many intercity bus companies have considerably higher requirements. Most prefer applicants who are at least 24 years of age; some prefer applicants who have bus or truck driving experience.

Since local transit and intercity busdrivers represent their companies in dealing with passengers, busdrivers must be courteous and tactful. All busdrivers need an even temperament and emotional stability because driving buses in heavy, fast-moving, or stop-and-go traffic and dealing with passengers can be a strain.

Most intercity bus companies and local transit systems give driver trainees 2 to 8 weeks of classroom and "behind-the-wheel" instruction. In the classroom, trainees learn U.S. Department of Transportation and company work rules, safety regulations, State and municipal driving regulations, and safe driving practices. They also learn to read schedules, determine fares, keep records, and deal tactfully and courteously with passengers.

Many persons who enter school busdriving have never driven any vehicle larger than an automobile. Depending on their driving experience, school busdrivers receive up to 1 week of driving instruction. They also receive classroom training on State and local laws, regulations, and policies governing the operation of school buses; safe driving practices; driver-pupil relations; first aid; and fire emergency procedures. Before they are allowed to transport students, school busdrivers must pass driving and written tests and—in some States—a background investigation to determine if the trainee has a criminal record or a history of mental problems.

Many busdriver trainees learn and practice driving skills on set courses. They make turns and zig-zag maneuvers, back up, and drive in narrow lanes. As they gain experience, they drive on lightly traveled roads, eventually advancing to heavily congested highways and city streets. They also make trial runs, without passengers, to improve their driving skills and learn the routes. Because a busdriver is seated higher than other drivers, defensive driving—seeing and avoiding possible traffic dangers ahead of time—has much potential and is stressed. Local transit trainees often must memorize and drive each of the runs operating out of their assigned garage. After completing final driving and written examinations, new drivers begin a "break in" period. During this period, they make regularly scheduled trips with passengers, often accompanied by an experienced driver who gives helpful tips, answers questions, and determines whether the new driver is performing satisfactorily.

Most experienced intercity and local transit drivers have regularly scheduled runs. New drivers, however, usually are placed on an "extra" list to substitute for regular drivers who are ill or on vacation. Charter runs also are driven by extra list drivers. Extra list transit busdrivers also are assigned extra and special runs—for example, those during morning and evening rush hours and to the stadium the day of a sports event. And in cities that use transit buses to transport children to school, extra list drivers operate these buses. New drivers remain on the extra list until they have enough seniority to get a regular run. This may take several years.

Busdrivers select assignments in order of length of service, or seniority. Therefore, as drivers acquire seniority, they can choose runs they prefer, such as those that lead to a greater number of work hours, lighter traffic, weekends off, or in the case of intercity busdrivers, higher earnings or fewer workdays per week.

Opportunities for promotions generally are limited. However, experienced drivers may advance to jobs as supervisors or dispatchers. These workers assign buses to drivers, check whether drivers are on schedule, reroute buses to avoid a blocked street or other problems, and dispatch extra vehicles and service crews to scenes of accidents and breakdowns. A few drivers advance to management positions. Promotion in publicly owned bus systems is often by competitive civil service examination.

Job Outlook

Job openings for busdrivers are expected to be plentiful through the mid-1990's. Thousands of openings will be created by growth in demand for drivers, but many more openings will arise as experienced busdrivers transfer to other occupations or leave the labor force. Most new jobs will be found in areas with a growing population, such as many communities in the Sunbelt States.

Employment of busdrivers is expected to increase about as fast as the average for all occupations through the mid-1990's. Employment of school busdrivers is expected to grow as enrollments in elementary and secondary schools increase, and as population continues to shift from the cities to the suburbs, where few students can walk to school.

Employment of local transit busdrivers is expected to increase as public transportation systems in growing communities expand. In addition, transit systems will hire greater numbers of part-time drivers who only work during either the morning or afternoon rush hours to replace full-time drivers on split shifts, in an effort to control costs in the face of peak rush hour demand. Demand will be offset somewhat, however, by the use of larger buses, shifting of riders to new subway and light rail systems, and falling ridership in areas with declining urban populations.

Like local transit busdrivers, growth of intercity busdriver jobs will be largely due to growing part-time employment. Intercity passenger travel will grow as population and income increase, but bus travel is not expected to grow. Buses are a relatively inexpensive mode of intercity travel, but higher incomes and cheaper air fares will enable more people to travel by plane, which provides faster—although more expensive—service over long distances.

Persons seeking intercity and local transit busdriving jobs can expect to face competition, since the relatively high wages, even for part-time work, attract many applicants.

Full-time local transit busdrivers are rarely laid off during recessions because scheduled service still must be provided. However, part-time drivers may be laid off if bus ridership decreases, because fewer extra buses may be needed during rush hours. Seasonal layoffs are common. Many intercity busdrivers with little seniority, for example, are furloughed during the winter when regular schedule and charter business falls off, and school busdrivers do not work during the summer or school holidays.

Earnings

Median weekly earnings of busdrivers who worked full time were about $300 in 1984. The middle 50 percent earned between about $190 and $390 a week. The lowest 10 percent earned less than $150 a week, while the highest tenth earned more than $485 a week.

According to data compiled by the American Public Transit Association, local transit busdrivers in 25 cities with more than 1 million population had an average starting wage rate of $8.46 an hour in 1984, and an average top rate of $11.43 an hour; in cities with less than 100,000 population, drivers had an average starting rate of $6.82 an hour and an average top rate of $8.01 an hour. In most cities, drivers could reach the top rate in 2 or 3 years.

Based on data from the American Bus Association, intercity busdrivers had estimated average annual earnings of about $24,200 in 1984. Earnings of intercity busdrivers depend primarily on the number of miles they drive. Beginning drivers worked about 6 months out of the year and earned between $12,000 and $18,000, while many senior drivers who worked year round earned more than $30,000.

According to a survey by Educational Research Service, Inc., the median rate for school busdrivers employed by public school systems was $7.33 an hour during the 1984-85 school year. The middle 50 percent had starting hourly rates between $5.43 and $7.26 and top hourly rates between $6.98 and $8.99.

Most intercity and many local transit busdrivers are members of the Amalgamated Transit Union. Local transit busdrivers in New York and several other large cities belong to the Transport Workers Union of America. Some drivers belong to the United Transportation Union and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

Related Occupations

Other workers who drive vehicles on highways and city streets are taxidrivers, truckdrivers, and chauffeurs.

Sources of Additional Information

For further information on employment opportunities, contact local transit systems, intercity buslines, school systems, or the local offices of the State employment service.

General information on local transit busdriving is available from:

American Public Transit Association, 1225 Connecticut Ave. NW., Suite 200, Washington, D.C. 20036.

General information on intercity busdriving is available from:

American Bus Association, 1025 Connecticut Ave. NW., Suite 308, Washington, D.C. 20036.

Construction Machinery Operators

(D.O.T. 850.663 except -018 and -022; .683 except -034; 851.663-010; 853.683-014; 859.683-010 and -014; 869.683-014; and 921.663 except -018, -026, -034, -050, and -066)

Nature of the Work

Lifting and positioning a quarter-ton pane of glass by crane into an 8-foot by 10-foot window opening 10 stories above the ground require considerable skill. At the crane's controls is a construction machinery operator, also known as an operating engineer. These operators also work the controls of bulldozers, trench excavators, and many other specialized machines used at construction sites. (Many workers operate similar machines in mining, logging, manufacturing, transportation, and utilities industries and in government. However, only those in construction are covered in this statement.) Some workers operate many kinds of machines; others only a few. Operators may also make adjustments and minor repairs. Because the skills and training required vary, construction machinery operators usually are classified by the type of machines they operate. The following paragraphs discuss the duties of operators of three commonly used types of equipment: Tower cranes, bulldozers, and air compressors.

Tower cranes are used to lift and move building materials around a construction site. The crane operator climbs a ladder inside the crane's mast—a tall steel tower—to the control booth located beneath the crane's boom—a long steel arm perpendicular to the mast. The operator must accurately judge distances and heights to pick up and deliver materials by pushing or pulling buttons, levers, and pedals in proper sequence. These controls rotate the boom around the mast, and raise and lower a cable with a hook that lifts materials and equipment at the worksite. At times, the operator may not see either the pick-up or the delivery point and must follow the hand signals or radio commands of another worker.

Bulldozers gouge out, level, and distribute earth, and remove trees, rocks, and debris before building starts. Bulldozer operators generally handle fewer controls than crane operators, and since the "dozer" operator works at ground level, estimating distances is less of a problem. The operator raises or lowers the "blade" attached to the front of the "dozer" by pushing a button or by pushing or pulling a lever. To clear land, a bulldozer operator lowers the blade to the ground, shifts to forward gear, and presses a pedal for power, causing the blade to scrape and level the ground. The operator repeats the process until the land is cleared and graded.

Air-compressor operators tend machines that feed compressed air through a heavy-duty hose to run special "air" tools, such as jackhammers. Before starting an air compressor, the operator checks fuel and water levels and hose connections and may manually pump air through the compressor to check for leaks. The operator starts the air compressor and allows it to build sufficient pressure to operate efficiently. While the compressor is running, the operator periodically checks fuel, water, and pressure levels. At the end of the workday, the operator turns the compressor off and "bleeds off" pressure in the tank and hose by opening a release valve. This allows an easy start the next time the compressor is to be used.

Construction machinery operator helpers, sometimes called "oilers," make sure the machines have fuel and oil and are properly lubricated. Helpers also make minor repairs and adjustments. Major repairs, however, usually are made by heavy-equipment mechanics.

Working Conditions

Construction machinery operators work outdoors, in hot and cold weather, but do not usually work in rain or snow. Operating some machines, particularly bulldozers and scrapers, is physically tiring because the constant movement of the machine shakes or jolts the operator. Also, most machines are noisy. In addition, operators can be injured in accidents involving the equipment. Tower crane operators, for example, may fall as they climb to or from the crane's control booth. As with most machinery, safety practices must be constantly observed to protect all workers on the jobsite.

The constant movement of some machines is physically tiring.

Employment

Approximately 210,000 construction machinery operators held jobs in the construction industry in 1984. Many worked for general building contractors in highway, dam, airport, and other large-scale construction projects. Others worked for special trade contractors who performed concrete work, structural steel erection, and excavating and foundation work. Very few were self-employed.

Construction machinery operators work in every section of the country. Some work in remote locations on large construction projects, such as highways and dams.

Training, Other Qualifications, and Advancement

Most individuals learn the trade by beginning as truckdrivers or machinery operator helpers. Helpers may do simple tasks such as cleaning, greasing, and starting machines. Then, under an experienced operator, they learn to operate light equipment. Later, they may learn to operate heavier equipment such as bulldozers and cranes. Most training authorities recommend a 3-year apprenticeship as the best way to become a construction machinery operator. Since apprentices learn to operate a wider variety of machines than other beginners, they have better job opportunities.

The apprenticeship program consists of at least 3 years of on-the-job training and 144 hours a year of related classroom instruction. The programs are administered by union-management committees of the International Union of Operating Engineers and the Associated General Contractors of America.

On the job, trainees are taught to operate, maintain, and repair various types of construction equipment and machinery. In the classroom, apprentices receive instruction in engine operation and repair, cable splicing, hydraulics, welding, and safety and first aid.

Employers prefer to hire high school graduates who are at least 18 years old. Courses in automobile mechanics and experience in operating tractors and other farm machinery are helpful. Armed Forces training in heavy equipment can also be useful.

Private vocational schools offer instruction in the operation of certain types of construction equipment. Completion of such a program may help a person get a job as a trainee or apprentice. However, persons considering such training should check the reputation of the school among construction employers in the area.

Construction machinery operators need to be alert and have a good sense of balance as well as good eye-hand-foot coordination and physical strength. Advancement is limited. Some operators may become supervisors. Some start their own business, but this path generally requires large capital outlays and managerial skill.

Job Outlook

Employment of construction machinery operators is expected to grow about as fast as the average for all occupations through the mid-1990's. Population and business growth will lead to the construction of more factories, office buildings, and other structures.

Besides the job openings created by increased demand for operating engineers, many openings will arise as experienced workers transfer to other occupations or leave the labor force. Jobs should be easiest to find during spring and summer since construction activity generally increases as the weather becomes warmer. Because construction activity is very sensitive to changes in economic conditions, the number of job openings may fluctuate widely from year to year. When construction activity declines, however, operating engineers who are laid off may find jobs in other industries.

Earnings

Earnings for construction machinery operators vary considerably, depending upon the type of equipment, but median earnings were about $375 a week in 1984. Persons operating light equipment such as pumps and air compressors generally earn less than those operating bulldozers and other types of heavy equipment. Pay scales generally are higher in metropolitan areas. Wage rates for apprentices start at about 70 percent of the full rate paid to experienced workers and increase periodically. Annual earnings of operators and apprentices may be lower than weekly rates would indicate because the amount of time they work can be limited by bad weather.

Many construction machinery operators are members of the International Union of Operating Engineers.

Related Occupations

Workers in agriculture, mining, manufacturing, public utilities, and transportation industries also use specialized machinery to move earth and materials, including bridge-or-gantry-crane operators, coke loaders, conveyor operators, mining machine operators, stevedores, and yarding engineers.

Sources of Additional Information

For further information about apprenticeships or work opportunities in this occupation, contact a local of the International Union of Operating Engineers; a local apprenticeship committee; or the nearest office of the State apprenticeship agency. In addition, the local office of the State employment service may provide information about apprenticeship and other programs that provide training opportunities.

For general information about the work of operating engineers, contact:

Associated Builders and Contractors, 729 15th St. NW., Washington, D.C. 20005.

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

Industrial Truck and Tractor Operators

(D.O.T. 519.663-014 and .683-014; 921.583 and .683-042, -050, -070, and -078; 929.583 and .683-014)

Nature of the Work

In the past, when a company needed products or raw materials moved from one place to another, workers were required to move the items manually. In most cases, this method was physically demanding and inefficient. Today, the task has been greatly facilitated by the use of industrial trucks and tractors.

A typical industrial truck, often called a forklift, has a hydraulic lifting mechanism and forks to carry a load on a wooden skid or pallet, or other attachments for greater versatility. For example, a truck may have a clamp lift to move cartons, bales, or paper rolls, or multiforks to handle concrete blocks. Industrial tractors are used in factories, warehouses, and outdoors to pull trailers loaded with materials, goods, or equipment.

Because the trucks are steered by the rear wheels and start and stop very quickly, operators must use care and skill in driving. Although industrial trucks are relatively easy to operate, operators usually must follow special procedures at a plant, warehouse, or construction site. For example, forks must be kept down if the truck is driven without a load. If the load is too high or too wide to see around, the operator must drive the truck in reverse. When loading or removing materials that are stacked on the floor or on a platform, drivers must judge distance accurately and operate the truck smoothly so that no damage occurs to the stock. Operators also must know the lifting capacity of the truck and the kinds of jobs it can do.

Operators may have to keep records of materials moved and do some manual loading and unloading. They also may be responsible for keeping their trucks in good working condition by cleaning and oiling them, checking the water in the batteries, making simple adjustments, and reporting any mechanical problems.

Working Conditions

Industrial truck and tractor operators are subject to hazards such as collisions and falling objects. Safety laws to minimize these hazards have led to safer, quieter, and better handling trucks. For example, most rider-type industrial trucks now have overhead guards, and many trucks and tractors used outdoors have all-weather cabs. Also, many firms are using battery-powered trucks and tractors which are relatively noiseless and pollution free.

Employment

Industrial truck and tractor operators held about 389,000 jobs in 1984. Over two-thirds of them worked in manufacturing industries. Large numbers were employed in plants that made automobiles, machinery, fabricated metal products, paper, building materials, and iron and steel. Many industrial truck and tractor operators also were employed in warehouses, depots, freight and marine terminals, and lumber yards.

Industrial truck and tractor operators are employed in all parts of the country, but most work in large industrial and transportation centers.

Training, Other Qualifications, and Advancement

Few employers have educational or training prerequisites for industrial truck and tractor operator jobs. Most persons who enter this occupation have no more than a high school education. Most entrants transfer from another occupation or have previously been unemployed.

Industrial truck and tractor operators train on the job. Most workers can learn to operate an industrial truck or tractor in a few days. It takes several weeks, however, to learn the layout of the plant, the operation of a truck in the plant, and the handling of materials in the most efficient way.

Many companies have training programs that include formal instruction, demonstrations, and practice with the industrial truck or tractor. Trainees learn how the truck and its lift operate, proper methods of transporting materials, simple maintenance procedures, and safe driving rules. These 1- to 5-day programs stress practice with industrial trucks or tractors, which trainees may be required to operate on an obstacle course. Because trucks and tractors are becoming more ver-

Industrial truck and tractor operators must judge distances accurately and drive carefully so that stock is not damaged.

satile and expensive, firms are expected to emphasize training programs which will increase the skills of operators to avoid damage to equipment and materials and minimize the risk of injury from accidents.

Employers seek applicants who have average manual dexterity, strength, and stamina because operators must get on and off the truck or tractor frequently and occasionally load and unload material. Good eyesight, especially good depth perception, is required to pick up, move, and deposit loads with the industrial truck. Large companies generally require applicants to pass a physical examination. Some mechanical ability is helpful because operators often perform minor maintenance on industrial truck and tractors.

Opportunities for advancement are limited. A few operators may become supervisors.

Job Outlook

Employment of industrial truck and tractor operators is expected to decline through the mid-1990's. Virtually all job openings will arise because of the need to replace industrial truck and tractor operators who transfer to other occupations or leave the labor force. Replacement needs for this occupation are greater than for most occupations because operators are more likely to transfer to other types of jobs.

Despite the growing volume of goods produced and shipped, increased use of automated material handling systems in large factories and warehouses should result in fewer operator jobs. These computerized systems enable industrial truck and tractor operators to move greater quantities of goods more efficiently. In some plants, industrial trucks and tractors may even be replaced by a series of conveyor belts and computer-controlled lift mechanisms.

Industrial truck and tractor operator jobs, over two-thirds of which are in manufacturing firms, are quickly affected by swings in the level of economic activity. During recessions, industrial truck and tractor operators are subject to layoffs.

Earnings

Industrial truck and tractor operators had median earnings of $330 a week in 1984. The middle 50 percent earned between $250 and $440 a week. Forklift operators averaged $9.77 an hour in 1984, while power-truck operators earned slightly more. Earnings of operators varied slightly by region and industry.

Related Occupations

Other occupations using power-operated equipment to lift and move materials include conveyor console operators, crane operators, derrick operators, hoist engineers, jammer operators, and operating engineers.

Sources of Additional Information

Information on work opportunities for industrial truck and tractor operators may be available from the local office of the State employment service.

Truckdrivers

(D.O.T. 292.353, .363, .463, .483, and .667; 900.683 through 905.683; 906; 909.663; 919.663-018, -022, -026; and 953.583)

Nature of the Work

Nearly all goods are transported by truck during some, or all, of their journey from producers to consumers. Goods may also be shipped between terminals or warehouses in different cities by trains, ships, or planes. But trucks usually make the initial pickup from factories, consolidate cargo at terminals for intercity shipment, and deliver goods from terminals to stores and homes.

Before leaving the terminal or warehouse, truckdrivers check their trucks for fuel and oil. They also inspect the trucks they will drive to make sure the brakes, windshield wipers, and lights are working and see that a fire extinguisher, emergency warning devices, and other safety equipment are aboard. Drivers adjust mirrors so that both sides of the truck are visible from the driver's seat, and make sure the cargo has been loaded properly so it will not shift during the trip. Drivers report any equipment that does not work, or is missing, or cargo that is not loaded properly to the dispatcher.

Once underway, drivers must be alert to prevent accidents and to drive their trucks efficiently. Because drivers of large tractor-trailers sit higher than cars, pickups, and vans, they can see far down the road. They seek traffic lanes that allow them to move at a steady speed, and, when going downhill, they may increase speed slightly to gain momentum for a hill ahead.

Long-distance runs vary widely. On short "turnarounds," truckdrivers deliver a load to a nearby city, pick up another loaded trailer, and drive it back to their home base the same day. Other runs take an entire day, and drivers remain away from home overnight. On longer runs, drivers may haul loads from city to city for a week before returning home. Some companies use two drivers on very long runs. One drives while the other sleeps in a berth behind the cab. "Sleeper" runs may last for days, or even weeks.

Long-distance drivers who have regular runs transport freight to the same city on a regular basis. Because shippers request varying amounts of service to different cities every day, most drivers have unscheduled runs. Dispatchers tell these drivers when to report for work and where to haul the freight.

After long-distance truckdrivers reach their destination, they complete reports about the trip and the condition of the truck, as required by the U.S. Department of Transportation. They must give a detailed report of any accident.

Long-distance truckdrivers spend most of their working time behind the wheel. Drivers hauling some specialty cargo, though, often load or unload their trucks, since they may be the only one at the destination familiar with this procedure. Auto transport drivers, for example, drive and position the cars on the racks and remove them at the final destination. When picking up or delivering furniture, drivers of long-distance moving vans hire local workers to help them load or unload.

When local truckdrivers receive assignments from the dispatcher to make deliveries, pickups, or both, they also get delivery forms. Before the drivers arrive for work, material handlers generally have loaded the trucks and arranged the items in order of delivery to minimize handling of the merchandise.

At the customer's place of business, local truckdrivers generally load or unload the merchandise. If there are heavy loads or many deliveries to make during the day, drivers may have helpers. Customers must sign receipts for goods and drivers may collect money for material delivered. At the end of the day, they turn in receipts, money, and records of deliveries made and report mechanical problems with their trucks.

The work of local truckdrivers varies, depending on the product they transport. Produce truckers usually pick up a loaded truck in the early morning and spend the rest of the day delivering produce to many different grocery stores. Lumber truckdrivers, on the other hand, make several trips from the lumber yard to one or more construction sites. Gasoline tank truckdrivers attach the hoses to transfer the gasoline to gas stations' storage tanks.

Some local truckdrivers have sales and customer relations responsibilities. These drivers—called driver-sales workers or route drivers—are primarily responsible for delivering their firm's products, but they also represent the company. Their reaction to customer complaints and requests for special service can make the difference between a larger order and losing a customer. Route drivers also may use their selling ability to increase sales and to gain additional customers.

The duties of driver-sales workers vary according to the industry in which they are employed, the policies of their particular company, and how strongly their sales responsibilities are emphasized. Most have wholesale routes—that is, they deliver to businesses and stores rather than homes. A few deliver various foods to homes, or pick up and deliver drycleaning, but retail routes are now rare.

Wholesale bakery driver-sales workers, for example, deliver and arrange bread, cakes, rolls, and other baked goods on display racks of grocery stores. Paying close attention to the items that are selling well or sitting on the shelves, they estimate the amount and variety of baked goods that will be sold. They may recommend changes in a store's order or may encourage the manager to stock new bakery products. From time to time, they try to get the business of new stores along their route.

Driver-sales workers employed by laundries that rent linens, towels, work clothes, and other items visit businesses regularly to replace soiled laundry.

Vending machine driver-sales workers, who service machines in factories, schools, and other buildings, check items remaining in the machines, replace stock, and remove money deposited in the cash boxes. They also examine each vending machine to see that merchandise and change are dispensed properly, make minor repairs, and clean machines.

After completing their route, driver-sales workers order items for the next day which they think customers are likely to buy, based primarily on what products have been selling well, the weather, time of year, and any discussion they may have had with customers.

Working Conditions

Truckdriving has become less physically demanding because most trucks now have more comfortable seats, better ventilation, and improved cab designs. However, making many deliveries during a day and driving in heavy traffic can be nerve racking. Local truckdrivers, unlike long-distance drivers, usually can return home in the evening.

Local truckdrivers frequently work 48 hours or more a week. Many who handle food for chain grocery stores, produce markets, or bakeries drive at night or early in the morning. Although most drivers have a regular route, some have different routes each day. Many local truckdrivers—particularly driver-sales workers—load and unload their own trucks, requiring considerable lifting, carrying, and walking.

The U.S. Department of Transportation governs work hours and other matters of trucking companies engaged in interstate commerce. For example, a driver cannot be on duty for more than 60 hours in any 7-day period and cannot drive more than 10 hours without being off duty at least 8 hours. Many drivers, particularly on long runs, work close to the maximum hours permitted. Drivers on long runs must remain alert for extended periods of time. Although many drivers work during the day, night travel is common and frequently preferred because roads are less crowded and trips take less time.

Employment

Truckdrivers held nearly 2.5 million jobs in 1984. Jobs are concentrated in and around large cities. Some drivers are employed in almost all communities, however.

Trucking companies employed over one-fourth of all truckdrivers. Over

Local truckdrivers generally load or unload the merchandise.

one-third worked for companies engaged in wholesale or retail trade, such as auto parts stores, oil companies, lumber yards, or distributors of food and grocery products. The rest were scattered throughout the economy, including government agencies. Less than one-tenth of all truckdrivers are self-employed; of these, a significant number are owner-operators, who either operate independently, serving a variety of businesses, or lease their services and their trucks to a trucking company.

Training, Other Qualifications, and Advancement

Qualifications for truckdrivers vary considerably, depending upon the type of truck and the nature of the employer's business. In most States, applicants must have a chauffeur's license, which is a commercial driving permit. Information on how to get this license can be obtained from State motor vehicle departments. Applicants may have to pass a general physical examination, a written examination on driving regulations, and a driving test. They should have good hearing and at least 20/40 vision with or without glasses, be able to lift heavy objects, and be in good health

The U.S. Department of Transportation establishes minimum qualifications for truckdrivers who are engaged in interstate commerce. A driver must be at least 21 years old and pass a physical examination, which the employer usually pays for. Good hearing, 20/40 vision with or without glasses, normal use of arms and legs (unless a waiver is obtained), and normal blood pressure are the main physical requirements. In addition, drivers must take a written examination on the Motor Carrier Safety Regulations of the U.S. Department of Transportation.

Many trucking operations have higher standards than those described. Many firms require that new drivers be at least 25 years old. Others specify height and weight limitations. Some companies employ only applicants who have driven trucks for several years.

Driver-training courses are a desirable method of preparing for truckdriving jobs. Most training authorities and employers recommend high school driver-training courses. In addition, a high school course in automotive mechanics helps drivers make minor roadside repairs.

A small number of private and public technical-vocational schools offer truckdriving courses. Students learn to inspect the trucks and freight, to drive large vehicles in crowded areas and in highway traffic, and to comply with Federal, State, and local regulations. Completion of a course, however, does not assure a job. Graduates of these schools who do get truckdriving jobs often start as local drivers. Persons interested in attending one of these schools should check with local trucking companies to make sure the school's training is acceptable to them.

Employers prefer applicants with a good driving record and some previous experience driving a truck. Very few people enter truckdriving directly from school. Consideration is given to driving experience in the Armed Forces. A person also may drive part of the day as a truckdriver's helper. When driving vacancies occur, senior helpers usually are promoted.

A more common method of entering truckdriving is to start out as a dockworker, loading and unloading freight. Dockworkers get a general idea of the trucking operation, and they may have an opportunity to move trucks around the yard. When a need for a truckdriver develops, a capable dockworker may be promoted. New drivers often start on panel or other small "straight" trucks. As they gain experience and show good driving skills, they may advance to larger and heavier trucks, and finally to tractor-trailers. Local drivers with tractor-trailer experience are good candidates for long-distance jobs. Graduates of truckdriving schools who cannot get driving jobs sometimes become dockworkers. Their school experience gives them an advantage over other dockworkers when driving vacancies occur.

Since drivers often deal directly with the company's customers, they must get along well with people. For jobs as driver-sales workers, an ability to speak well and a neat appearance are particularly important, as are self-confidence, initiative, and tact. For all truckdriver jobs, employers also look for responsible, self-motivated individuals, since drivers work with little supervision.

Training given to new drivers usually is informal and may consist only of a few hours of instruction from an experienced driver, sometimes on the new employee's own time. New drivers also may ride with and observe experienced drivers before being assigned their own runs. Additional training may be given if they are to drive a special type of truck. Some companies give 1 to 2 days of classroom instruction which covers general duties, the operation and loading of a truck, company policies, and the preparation of delivery forms and company records. Driver-sales workers also receive training on the various types of products they carry so they will be more effective sales workers and better able to handle customer requests.

Although some new truckdrivers are assigned immediately to regular driving jobs, many start as extra drivers, who substitute for regular drivers who are ill or on vacation. They receive a regular assignment when an opening occurs.

Some long-distance truckers purchase a truck and go into business for themselves. Although many of these owner-operators are successful, others fail to cover expenses and eventually lose their trucks. Owner-operators should have good business sense as well as truckdriving experience. Courses in accounting, business, and business arithmetic are helpful.

Local truckdrivers may advance to dispatcher, to manager, or to traffic work—for example, planning delivery schedules. However, relatively few of these jobs are available. For the most part, a local truckdriver may advance to driving heavy or special types of trucks or transfer to long-distance truckdriving. Working for companies that also employ long-distance drivers is the best way to advance to these positions. Most drivers can only advance to driving runs that provide increased earnings or preferred schedules and working conditions.

Job Outlook

Employment of truckdrivers is expected to increase about as fast as the average for all occupations through the mid-1990's. The demand for drivers should increase as the amount of freight carried by trucks increases. The number of truckdrivers with sales responsibilities is expected to decline as companies shift sales, ordering, and customer service to sales and office staffs, and replace driver-sales workers with delivery drivers.

This occupation has among the largest number of job openings each year. Although thousands of openings will be created by growth in demand for drivers, the majority will occur as experienced drivers transfer to other fields of work, retire, or leave the labor force for other reasons. Since driver earnings are high and no formal training is required, applicants can expect to face strong competition for available jobs.

Job opportunities may vary from year to year because the amount of freight moved by trucks fluctuates with the economy. Many new truckdrivers are hired when the economy and the volume of freight are expanding, but few when these decline. During economic slowdowns, some truckdrivers are laid off and others have decreased earnings because of reduced hours. Those in industries such as wholesale food distribution, which is usually not affected much by recessions, are less likely to be laid off.

Earnings

As a rule, local truckdrivers are paid by the hour and receive extra pay for working overtime, usually after 40 hours. The earnings of long-distance drivers vary, depending on mileage driven, number of hours worked, and type of truck. Most driver-sales workers receive a commission based on their sales, in addition to an hourly wage. However, straight-time pay rates are fairly uniform because truckdriving is highly unionized, and union contracts generally cover all drivers within a multistate region.

In 1984, truckdrivers had average straight-time hourly earnings of $10.31. Depending on the size truck, average earnings were as follows:

Tractor-trailer	$11.28
Medium truck	10.23
Heavy straight truck	9.80
Light truck or van	7.21

Most long-distance truckdrivers operate tractor-trailers. Drivers employed by trucking companies had the highest earnings, averaging nearly $12 an hour in 1984. Truckdrivers in the North Central States had the highest earnings while those in the South had the lowest.

Many truckdrivers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Some truckdrivers employed by companies outside the trucking industry are members of unions that represent the plant workers of the companies for which they work.

Related Occupations

Other driving occupations include ambulance driver, busdriver, chauffeur, hostler, and taxi driver.

Sources of Additional Information

Information on truckdriver training schools and on career opportunities in the trucking industry may be obtained from:

American Trucking Associations, 2200 Mill Rd., Alexandria, Va. 22314.

For details on truckdriver employment opportunities, contact local trucking companies or the local office of the State employment service.

Helpers, Handlers, Equipment Cleaners, and Laborers

Helpers, handlers, equipment cleaners, and laborers assist skilled workers and perform the routine tasks required to complete a project. Millions of persons work in these jobs in nearly every industry and geographic area of the Nation.

Helpers assist machine operators and tenders who work with metal, wood, plastic, textiles, and other materials. Some helpers aid workers who fabricate, assemble, and hand finish manufactured goods. Others help workers who inspect, test, examine, and sample raw materials and finished products. Mechanic and repairer helpers aid in adjusting, maintaining, and repairing tools, equipment, and machines. In the construction trades, helpers and laborers work with bricklayers, carpenters, electricians, painters, surveyors, and others to build and maintain buildings, roads, bridges, and other projects. Still other helpers assist in drilling oil wells, blasting, and cutting materials to be mined.

Most handlers, equipment cleaners, and laborers lift and carry materials. Garbage collectors gather refuse for disposal. Stevedores load and unload ships' cargoes. Stock handlers sort and place tools, equipment, and other materials. Baggers package groceries. Machine feeders deposit or remove materials from machines or equipment. Other workers pack materials for shipment and storage.

Many other workers perform routine tasks. Fuel pump attendants and lubricators fill gas tanks, check engine oil, and do other routine services on cars and trucks in garages and gasoline service stations. Parking lot attendants park cars at lots and garages. Cleaners work in many industries to help maintain the appearance and function of vehicles and equipment.

Jobs as helpers, handlers, equipment cleaners, and laborers generally have minimal education requirements. Duties usually are learned on the job or in short training sessions given by the employer. It should be noted, however, that these jobs are often used as entry level positions to more skilled craft and semiskilled operative occupations.

Workers in these occupations must be physically fit because most jobs require physical exertion, such as frequent bending and heavy lifting. Jobs may require outdoor work, sometimes in uncomfortable weather conditions. Occupational hazards include cuts, burns, and sore or strained muscles.

Jobs as helpers, handlers, equipment cleaners, and laborers are expected to be plentiful due to the very high turnover rate in these occupations. However, some workers may be laid off during recessions. This is particularly common in the construction and manufacturing industries, both sensitive to cyclical swings in the economy.

Many helpers, handlers, equipment cleaners, and laborers earn relatively low wages. Supervisors and workers who belong to unions, however, can expect to earn higher wages.

Detailed information on the nature of the work, employment, training requirements, job outlook, earnings, and working conditions for construction trades helpers—the largest of the helper, handler, equipment cleaner, and laborer occupations—is presented in the following statement.

Construction Trades Helpers

(List of D.O.T. codes available on request. See p. 495.)

Nature of the Work

Construction trades helpers, also known as construction laborers, provide much of the routine physical labor on all types of construction projects. They perform a wide variety of tasks, often working without close supervision. They dig trenches, set braces to support the sides of excavations, clean up rubble and debris, and unload and deliver materials, machinery, and equipment to carpenters, masons, and other construction workers during all phases of a construction project.

Some construction laborers have job titles that indicate the work they do. Bricklayers' tenders and plasterers' tenders, both commonly known as hod carriers, help bricklayers and plasterers by mixing and supplying materials, setting up and moving scaffolding, and providing many other services. Hod carriers must be familiar with the work of bricklayers and plasterers and know the materials and tools they use. Construction laborers also pour and place concrete for cement masons, who do the finishing work.

Laborers may operate motorized equipment such as cement mixers and lifts and ditchdiggers of the "walk-behind" variety, small mechanical hoists, and laser beam equipment to align and grade ditches and tunnels.

Working Conditions

Construction work is physically strenuous, since it requires frequent bending, climbing, and heavy lifting. Much of the work is performed outdoors. Construction helpers, like almost all other workers in construction occupations, are subject to falls from scaffolds; cuts, burns, and abrasions from various tools and equipment; and sore or strained muscles from heavy lifting.

Employment

Construction trades helpers held about 436,000 jobs in 1984. Construction contractors were their major employers.

Training, Other Qualifications, and Advancement

Although construction helpers' jobs require only a few basic skills, some jobs require training and experience, as well as familiarity with construction methods, materials, and operations. Generally, applicants must be at least 18 years old, in good physical condition, and be willing to work hard.

Many new employees transfer from lower paying occupations such as farm laborer or janitor. Many other persons take jobs as construction laborers because little previous experience is required.

Beginners' jobs are usually of the simplest type, such as unloading trucks or keeping the work area free of debris. As workers gain experience, job assignments become more complex. In order to prepare laborers for more difficult tasks, contractors and unions have established 4- to 8-week entry level training programs in many States to teach basic construction concepts, safety practices, and machinery operation. In addition, some programs offer training to help experienced laborers keep abreast of technological advances.

Job Outlook

Employment of construction trades helpers is expected to grow more slowly than the average for all occupations through the mid-1990's. Despite the projected slower than average growth, job openings should be plentiful because the occupation is large and turnover is high. Many people take laborer jobs in order to earn money for a specific purpose—for example, a college education—and quit after a short time. Others decide they don't like the work and leave the occupation. Still others stay only long enough to acquire the minimum skills that enable them to move into construction craft jobs such as carpenter, bricklayer, or cement mason.

Growth in population and economic activity will spur construction work in the years ahead. Laborer employment will not keep pace with the level of construction, however, as continued mechanization and technological advances reduce the need for human labor. This mechanization has affected helpers more than other construction occupations and will likely continue to do so.

Employment of construction laborers is highly sensitive to cyclical swings in the economy, particularly to the level of construction activity. Consequently, layoffs are common in economic downturns.

Earnings

Median weekly earnings for construction trades helpers working full time were about $225 in 1984. One-half earned between $185 and $300 weekly; the highest 10 percent earned more than $400 a week. Annual earnings for construction trades helpers generally are lower than weekly earnings would indicate because poor weather and downturns in construction activity limit the amount of time they can work.

Many construction laborers are members of the Laborers' International Union of North America.

Related Occupations

In assisting skilled craft workers, construction trades helpers combine strength, stamina, willingness to learn, and the ability to follow directions. Workers in other occupations that require similar characteristic are machine feeders, machine operator helpers, mechanic and repairer helpers, stevedores, and vehicle washers and equipment cleaners.

A bricklayer helper provides mortar for laying brick.

Sources of Additional Information

For information about work opportunities, contact local building or construction contractors, local construction associations, a local of the Laborers' International Union of North America, or the local office of the State employment service.

For general information about the work of construction laborers, contact:

Laborers' International Union of North America, 905 16th St. NW., Washington, D.C. 20006.

Laborers'—Associated General Contractors' Education and Training Fund, P.O. Box 37, Pomfret Center, Conn. 06259.

Military Occupations

Nature of the Work

The mission of the Armed Forces—the Army, Navy, Marine Corps, Air Force, and Coast Guard—is national defense. The Army prepares for land-based defense, while the Air Force provides for air and space defense. The Navy organizes and trains forces primarily for sea defense. The Marine Corps, a branch of the Navy, prepares for land and sea actions in support of naval operations or amphibious landings. The Coast Guard, under the Department of Transportation (except in wartime, when it serves the Navy), has responsibility for enforcing Federal maritime laws, conducting rescues of distressed vessels and aircraft at sea, operating aids to navigation, and preventing smuggling.

Together, the military services constitute the largest employer in the country. They offer a wide range of employment and training opportunities in managerial and administrative jobs, professional occupations, clerical work, skilled construction trades, electrical and electronic occupations, motor vehicle repair, and hundreds of other specialties requiring varied amounts of education and training. While military life differs from civilian life in important ways, each year the Armed Forces give hundreds of thousands of men and women basic and advanced training that is often transferable from military to civilian careers. A brief discussion of the relation of some major military occupations to civilian occupations follows.

Administrative, functional support, and clerical jobs in military service require the same basic skills that are needed for similar jobs in private businesses and government agencies. Officers in this category work as directors, executives, adjutants, administrative officers, personnel managers, training administrators, budget officers, finance officers, accountants, public affairs officers, hospital administrators, inspectors, computer systems managers, lawyers, chaplains, educators, instructors, social workers, and counselors. Enlisted personnel in this category work as accounting clerks, payroll clerks, personnel clerks, computer programmers, computer operators, electric accounting machine operators, chaplain assistants, counseling aides, typists, stenographers, storekeepers, and other clerks.

Professional, technical, and allied specialists in the military include a wide range of jobs with a civilian parallel. Officers work as physicists, nuclear power engineers, chemists, geologists, meteorologists, biologists, mathematicians, statisticians, operations research analysts, historians, economists, sociologists, and psychologists. Enlisted personnel work as drafters, topographic surveyors, photographers, broadcasters, musicians, safety specialists, and scientific or engineering assistants. Some work as divers and in ordnance disposal.

Military medical and dental specialists and technicians all have civilian counterparts. Medical officers include physicians, dentists, optometrists, professional nurses, therapists, veterinarians, pharmacists, and others associated with patient care and treatment. Education and training received in the military are recognized in the civilian sector. Enlisted personnel include medical, dental, and laboratory technicians, pharmaceutical assistants, sanitation specialists, and veterinary assistants. After leaving the military, service-trained medical and dental technicians may be qualified to take the certification examinations for entry into civilian jobs. (Completion of an accredited program is a prerequisite for certification or registration in many health occupations.) Civilian occupations for which service-trained individuals may qualify for certification include medical laboratory technician, medical laboratory technologist, radiologic technologist, emergency medical technician, and dental assistant.

Although few *intelligence and communication specialists* have civilian counterparts, some may transfer their skills to civilian jobs. Officers work as translators, cryptologists, information analysts, and in related occupations. Enlisted personnel operate radio, radar, sonar, and other equipment and help analyze the information gathered.

Engineers, maintenance personnel, and repairers—electrical and mechanical equipment are responsible for the aircraft, motor vehicles, missiles, ships, ordnance, and other equipment of the Armed Forces. Officers work as engineers—electrical, mechanical, design, aeronautical, marine, missile, and ordnance—and are responsible for the design, development, production, and testing of equipment and oversee its maintenance. Enlisted personnel work as mechanics and repairers and are directly responsible for repair and maintenance. Many of these occupational skills can be transferred to civilian jobs.

Engineers, maintenance personnel, and repairers—electronic and related equipment are responsible for radio, radar, missile guidance, navigation, nuclear weapons, computer, cryptographic, and related equipment. Officers work as engineers—electrical, electronic, communication, and radar design—and are responsible for the design, development, production, and testing of equipment and oversee its maintenance. Enlisted personnel work as mechanics and repairers and are directly responsible for repair and maintenance. Again, many of these occupational skills can be transferred to civilian jobs.

Engineers, maintenance personnel, and craft workers—installations, utilities, and other functions are responsible for the erection and maintenance of buildings and oversee the operations of utilities. Officers include civil engineers and architects. Enlisted personnel include carpenters, construction equipment operators, metal workers, machinists, plumbers, electricians, heating specialists, lithographers, leather workers, and others. Generally, veterans in this category who enter the civilian work force are given credit for skills and training acquired in the service.

Service and supply handlers are responsible for procurement, supply, transportation, exchange, food service, security, housing, and other operations. Officers oversee these operations. Enlisted personnel include motor vehicle operators, military police, corrections specialists, drycleaning operators, material handlers, warehouse workers, postal workers, and food preparation and other service workers. Many of these skills can be transferred to civilian occupations.

Infantry, gun crews, and seamanship specialists include the combat occupations—the backbone of the Armed Forces. Officers plan and direct military operations, oversee security activities, and serve as combat troop leaders, ship captains and crew, and airplane pilots and crew members. Enlisted personnel serve as weapons specialists, armored vehicle operators, demolition experts, artillery crew, rocket specialists, airplane and ship crew members, boatswains, navigators, and installation security specialists. Although these functions are unique to the Armed Forces, they involve skills that can be applied to a number of civilian occupations such as ammunition inspector, cartographer, and heavy equipment operator. In addition, personnel in this category may develop leadership and supervisory skills for future civilian employment.

Nonoccupational categories include officer candidates, trainees, students, patients, prisoners, and others for whom an occupation is not applicable or has not been designated.

Working Conditions

Military life is more disciplined and regimented than civilian life. There are dress and grooming requirements. Certain military formalities, such as saluting superior officers, and special military laws must be followed.

Hours and working conditions vary substantially in the wide range of jobs found in military service. Most military personnel usually work 8 hours a day, 5 or 5-1/2 days a week. Some assignments, however, require night and weekend work, or require persons to be on call at all hours. All may require substantial travel. Many require long periods at sea, sometimes in cramped quarters, or lengthy overseas assignments in countries offering few amenities. Some jobs are in isolated areas subject to extreme cold or heat. Others—even in noncombat situations—are quite hazardous. Persons with such assignments normally receive additional compensation.

Distribution of Military Personnel

In 1984, nearly 2.2 million persons were on active duty in the Armed Forces—about 780,000 in the Army; 597,000 in the Air Force; 565,000 in the Navy; 196,000 in the Marine Corps; and 50,000 in the Coast Guard. In addition, over 2.3 million persons were in military reserve units, of whom 1.4 million were in active reserve units.

Military personnel are stationed throughout the United States and in many countries around the world. In the United States, the largest numbers are stationed in California, followed by Texas, North Carolina, Virginia, Georgia, and Florida. About 514,000 are stationed outside the United States. Over 350,000 of these are stationed in Europe (mainly in Germany); large numbers also are in the Western Pacific area.

Table 1 shows the occupational composition of the military establishment in 1984. Nearly 3 out of every 10 enlisted persons were involved with electrical, mechanical, electronic, and related equipment—reflecting the highly technical and mechanical nature of the fighting forces. Officers—who accounted for over 14 percent of all military personnel—are concentrated in administration, medical and dental specialties, and combat activities—largely as ships' officers, aircraft pilots and crew members, and infantry or artillery officers.

Submarines are operated under demanding conditions by highly trained personnel.

Enlistment and Officer Qualifications, Training, and Advancement

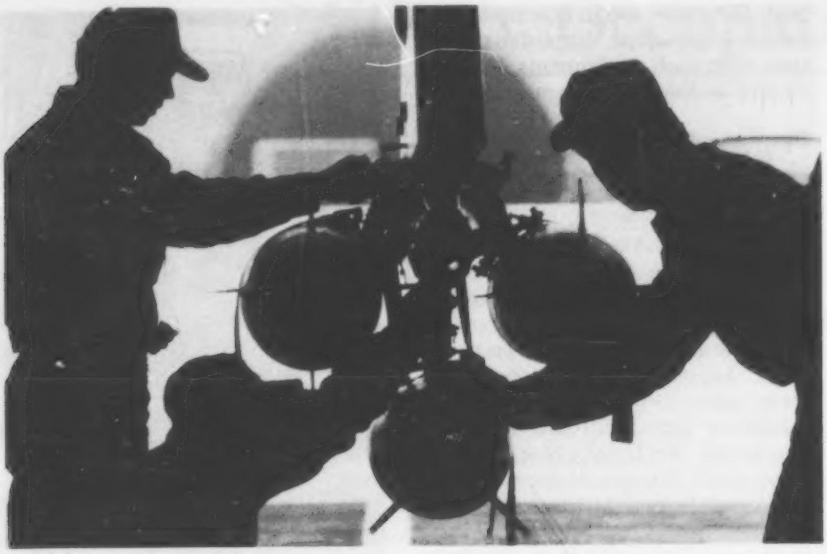
General enlistment qualifications. As it has since 1973, the military expects to continue to meet its personnel requirements through volunteer enlistees. Enlistees must enter a legal agree-

Table 1. Military personnel by broad occupational category, 1984

(Percent distribution)

Occupational category	Total	Enlisted personnel	Officers
All personnel (thousands)	2,188	1,876	312
Percent	100	100	100
Administrative, functional support, and clerical jobs	16	16	21
Professional, technical, and allied specialists	2	3	2
Medical and dental specialists and technicians	6	5	12
Intelligence and communications specialists	9	10	5
Engineers, maintenance officers, and repairers—electrical and mechanical equipment	19	20	11
Engineers, maintenance officers, and repairers—electronics and related equipment	9	9	4
Engineers, maintenance officers, and craft workers—transportation, utilities, and other functions	4	4	1
Service and supply handlers	9	10	7
Infantry, gun crew, and seamanship specialists	16	15	25
Nonoccupational	10	8	12

SOURCE: U.S. Department of Defense.



Team work is essential.

ment called an enlistment contract. This obligates the service to provide the agreed upon options—job, rating, pay, cash bonuses for enlistment in certain occupations, medical and other benefits, occupational training, and continuing education—and the enlistee to serve for the specified period of time.

All services offer a 'delayed entry program' by which an enlistee can delay entry into active duty for up to 1 year. High school students can enlist during their senior year and enter a service after graduation. Other enlistees choose this program because the job training they desire is not currently available but will be within the coming year.

Although specific enlistment requirements for each service or enlistment option within a particular service may vary, all branches have certain general qualifications. Enlistees must be between the ages of 17 and 35 and must possess a birth certificate. Applicants between 17 and 18 years old must have the consent of a parent or guardian before entering the service. Both a written examination (Armed Services Vocational Aptitude Battery) and a physical examination are required. All branches prefer high school graduation or its equivalent and require it for certain enlistment options. In 1984, 94 percent of all enlisted personnel were high school graduates.

The infantry is the main land combat force of the military services.

Enlistment options. A variety of enlistment options, each involving different combinations of active and reserve duty, is available. Most active duty programs range from 3 to 6 years; 3- and 4-year enlistments are the most common. Selection depends on the individual's general and technical aptitudes and personal preference as well as the needs of the service.

Women are now eligible to enter 95 percent of all military specialties. Only fields involving combat duty are excluded.

People planning to apply the skills gained through military training to a civilian career should obtain certain information before choosing a military occupation. First, they should determine how good the prospects are for civilian employment in jobs related to the military specialty which interests them. Second, they should know the prerequisites for the related civilian job. Many occupations require a license, certification, or a minimum level of education. Those who are interested should find out whether military training is sufficient to enter the field or, if not, what additional training will be required.

Other *Handbook* statements give much information about the job outlook for civilian occupations for which military training is helpful. Additional information often can be obtained from schools, unions, trade associations, and other organizations in the field of interest, or from a school counselor. By finding this information before choosing a specific military occupation, young people entering the Armed Forces will help ensure that the type of training they obtain will fit their career plans.

Training programs for enlisted personnel. After a 6- to 11-week basic training period, depending on the service branch, most recruits enter formal classroom training to prepare for a specialized field of work. The remainder receive on-the-job training at their first duty assignment. For those not assigned directly to schools, formal classroom training follows on-the-job training. After initial or advanced training, recruits are sent to their service assignment.

In addition to on-duty training, military personnel may choose from a variety of educational programs. Most military installations have a tuition assistance program for personnel who wish to take courses during off-duty hours. Also, each service branch offers programs for full-time education, and provides full pay, allowances, tuition, and related fees. Courses also are available to help service personnel earn their high school equivalency diplomas. In addition, programs are available to allow credit for military training courses towards associate or baccalaureate college degrees. Other programs enable enlisted personnel to take college courses and additional military training to become commissioned officers.

Officer training. Officer training in the Armed Forces is provided through the Federal Service Academies (Naval, Air Force, Military, and Coast Guard); the Reserve Officer Training Corps (ROTC); Officer Candidate School (OCS); the National Guard (State Officer Candidate School programs); and other programs.

Federal Service Academies provide a 4-year college program leading to a bachelor of science degree. The midshipman or cadet is provided free room and board, tuition, medical care, and a monthly allowance. Graduates receive regular commissions and have a 5-year active duty obligation, or longer if entering flight training.

To become a candidate for appointment as a midshipman or cadet in the Naval, Air Force, or Military Academy, most applicants obtain a nomination from an authorized source (usually a member of Congress). Candidates do not need to know a member of Congress personally to request a nomination. Nominees must have an academic record of the requisite quality, college aptitude test scores above an established minimum, and recommendations from teachers or school officials; they also must pass a medical examination. Appointments are made from the list of eligible nominees.

Women now serve in almost all military noncombat functions.

Appointments to the Coast Guard Academy are made on a competitive basis. A nomination is not required.

ROTC programs train students in about 500 Army, Navy, Marine Corps, and Air Force units at participating colleges and universities. Trainees take 2 to 5 hours of military instruction a week in addition to regular college courses. Students in the last 2 years of an ROTC program and all those on ROTC scholarships receive a monthly allowance while attending school and additional pay for summer training. After graduation, they serve as officers on active duty for a stipulated period of time.

College graduates can earn a commission in the Armed Forces through OCS Programs in the Army, Navy, Air Force, Marine Corps, Coast Guard, and National Guard.

Persons trained in health professions may qualify for direct appointment as officers. Financial assistance is available for students training in some fields. Direct appointments also are available for those qualified to serve in other special duties, such as the judge advocate general (legal) or chaplain corps.

Flight training is available to commissioned officers in each branch of the Armed Forces.

Advancement opportunities. Each service has different criteria for promoting personnel. Generally, however, new enlistees are promoted from the first to the third level within the first year. Subsequent promotions are based on a more competitive system. Criteria for promotion may include time in service and grade, proficiency in assigned duties, the evaluation and recommendation of the commanding officer, and written examinations.

Job Outlook

The number of jobs in the Armed Forces is expected to increase more slowly than the average for civilian occupations through the mid-1990's. Substantial numbers of new jobs will be created in the Navy and the Air Force to expand their strength. The Army, Marine Corps, and Coast Guard are expected to at least maintain their present levels. Job opportunities should be excellent in all branches of the service, as many thousands of persons must be recruited and trained each year to replace those who complete their enlistment or retire. Better educated and trained applicants will be in particular demand as military jobs become more technical and complex.

Military personnel enjoy more job security than their civilian counterparts. Satisfactory job performance generally assures one of steady employment and earnings.

Earnings, Allowances, and Benefits

Starting salaries. Starting annual salaries of military personnel are shown in table 2. Most enlisted personnel started at Grade E-1 in 1985; however, those with special skills or above average education started as high as Grade E-3. Most warrant officers started at Grade E-5 or E-6, depending upon their occupational and academic qualifications and the branch of service. Most commissioned officers started at Grade O-1; highly trained officers—for example, physicians, engineers, and scientists—started as high as Grade O-6.

Table 2. Military basic pay by grade for active personnel with less than 2 years of service, 1985

Pay grade	Yearly compensation
Enlisted personnel:	
E–1[1]	$6,832
E–1	7,445
E–2	8,345
E–3	8,676
Warrant officers:	
E–5	$9,871
E–6	11,246
Commissioned officers:	
O–1	$14,263
O–2	16,430
O–3	18,842
O–4	20,275
O–5	24,055
O–6	30,074

[1] Less than 4 months of service.

SOURCE: U.S. Department of Defense.

Allowances. In addition to basic pay, military personnel receive free room and board (or a housing and subsistence allowance), medical and dental care, a military clothing allowance, military supermarket and department store shopping privileges, 30 days of paid vacation a year, and travel opportunities.

Athletic and other recreational facilities—such as libraries, gymnasiums, tennis courts, golf courses, and movies—are available on many military installations. Help with personal or financial problems is available from personal affairs officers, legal assistance officers, counselors, and chaplains, as well as supporting agencies.

Special pay generally is awarded for unusually demanding or hazardous duties, assignment to duties in certain shortage skills, assignments to certain areas outside the continental United States, and outstanding proficiency in the performance of duty.

Military personnel are eligible for retirement benefits after 20 years of service.

Annual earnings. In 1984, the average compensation of all military personnel was $18,152 (of which 26 percent was cash allowances). Enlisted personnel averaged $15,704 (of which 29 percent was cash allowances); warrant officers averaged $27,221 (of which 21 percent was cash allowances); and commissioned officers averaged $33,389 (of which 18 percent was cash allowances).

Veterans' benefits. The Veterans Administration (VA) provides numerous benefits to those who have served in the Armed Forces for at least 2 years. Veterans are given care in VA hospitals for all service-connected disabilities regardless of time served; those with other medical problems can be given care if they are unable to pay the cost of hospitalization elsewhere. Veterans are eligible for certain loans, including home loans. Veterans, regardless of health, can convert a military life insurance policy to an individual policy with any participating company in the veteran's State of residence. In addition, job counseling, testing, and placement services are available.

Veterans who participate in the New GI Bill Program may receive educational benefits. Under this program, Armed Forces personnel may elect to save $100 a month for 12 months towards their future education. The Government will contribute up to $9,600, until the combined contributions reach a maximum of $10,800. This sum becomes the service member's educational fund. Upon separation from active duty, the fund can be used to finance an education at any VA-approved institution. VA-approved schools include vocational, correspondence, business, technical, and flight training schools; community and junior colleges; and colleges and universities.

Information on educational and other veterans' benefits is available from VA offices located in each State, the District of Columbia, Puerto Rico, and the Philippines.

Sources of Additional Information

Each of the military services publishes handbooks and pamphlets that describe entrance requirements, training and advancement opportunities, and other aspects of military careers. These publications are available at all recruiting stations, most State employment service offices, and in high schools, colleges, and public libraries. For additional information, write to:

U.S. Army Recruiting Command, Fort Sheridan, Ill. 60037.

USAF Recruiting Service, Directorate of Advertising and Publicity, Randolph Air Force Base, Tex. 78150.

Director, Personnel Procurement Division, Headquarters, U.S. Marine Corps, Washington, D.C. 20380.

Navy Opportunity Information Center, P.O. Box 5000, Clifton, N.J. 07015.

Commandant, (G-PMR), U.S. Coast Guard, Washington, D.C. 20593.

Appendix A. Summary Data for Occupations Not Covered in the Handbook

Employment in the approximately 200 occupations that are discussed in the main body of the *Handbook* accounts for about 60 percent of all jobs in the economy. Although occupations covering the full spectrum of work are included, generally those that require lengthy education or training or which are projected to grow rapidly are given the most attention.

This appendix presents summary data on an additional 200 occupations for which employment projections are prepared but for which detailed occupational information is not developed. These occupations account for about 20 percent of all jobs. For each occupation, a brief description of the nature of work, the number of jobs in 1984, and a phrase describing the projected employment change from 1984 to 1995 are presented. For guidelines underlying this descriptive phraseology, refer to the box on page 4 of the How To Get the Most From the Handbook section.

The approximately 20 percent of all jobs not covered either in the detailed occupational descriptions in the main body of the *Handbook* or in the summary data presented in this appendix are mainly residual categories, such as managers and administrators, not specified, for which little if any meaningful information could be developed.

Title	Definition	Employment 1984	Projected growth 1984–95
EXECUTIVE, ADMINISTRATIVE, AND MANAGERIAL OCCUPATIONS			
Assessors	Appraise real and personal property to determine its fair value. May assess taxes in accordance with prescribed schedules.	20,000	About as fast as average
Claims examiners, property and casualty insurance	Review settled insurance claims to determine that payments and settlements have been made in accordance with company practices and procedures and insure that adjusters have followed proper methods. Report overpayments, underpayments, and other irregularities. Confer with legal counsel on claims requiring litigation.	23,000	Faster than average
Claims takers, unemployment benefits	Interview unemployed workers and compile data to determine eligibility for unemployment benefits.	23,000	Little change
Cost estimators	Prepare cost estimates for manufacturing of products, construction projects, or services to aid management in bidding on or determining price of products or services. May specialize according to particular service performed or product produced.	114,000	About as fast as average
Employment interviewers, private or public employment service	Interview job applicants in employment office and refer them to prospective employers for consideration. Record and evaluate various pertinent data. Search application files, notify selected applicants of job openings, and refer qualified applicants to prospective employers. Contact employers to verify referral results and record data.	72,000	Much faster than average
Public administration—chief executives, legislators, and general administrators	Formulate and establish government policy and develop Federal, State, or local laws, rules, and regulations.	141,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Special agents, insurance	Recruit independent insurance agents in field and maintain contact between agents and home office. Advise agents on matters pertaining to conduct of business, such as cancellations, overdue accounts, technical problems, claims procedures, new business contacts, and new products. May gather information for underwriter. May inspect buildings to determine fire insurance rates.	26,000	About as fast as average
Tax examiners, collectors, and revenue agents	Determine tax liability or collect taxes from individuals or business firms according to prescribed laws and regulations.	52,000	Little change

PROFESSIONAL SPECIALTY OCCUPATIONS

Audiovisual specialists	Plan and prepare audiovisual teaching aids and methods for use in school system.	7,800	Slower than average
Directors, religious education and activities	Direct and coordinate activities of a denominational group to meet religious needs of students and plan, organize, and direct church school programs designed to promote religious education among church membership. Provide counseling and guidance relative to marital, health, financial, and religious problems.	34,000	Slower than average
Farm and home management advisors	Advise, instruct, and assist individuals and families engaged in agriculture and related processes or home economics activities. Apply research findings and procedures to solve problems and provide instruction and training in the development of products, sales, and the utilization of machinery and equipment.	27,000	Expected to decline
Graduate assistants, teaching	Assist department head, faculty members, or other professional staff in colleges or universities by performing related duties such as teaching lower level courses, developing teaching materials, preparing and giving examinations, and grading examinations or papers.	145,000	Expected to decline
Judges, magistrates, and other judicial workers	*Judges*: Arbitrate, advise, and administer justice in courts of law. Sentence defendants in criminal cases according to statutes of State or Federal government. May determine liability of defendants in civil cases. *Magistrates*: Adjudicate criminal cases not involving penitentiary sentences, and civil cases concerning damages below sum specified by State law. May issue marriage licenses and perform wedding ceremonies. *Adjudicators, hearings officers, and judicial reviewers*: Conduct hearings to review and decide claims filed by the government against individuals or organizations or individual eligibility issues concerning social programs or disability or unemployment benefits. Determine the existence and the amount of liability, recommend the acceptance or rejection of claims or compromise settlements according to laws, regulations, policies, and precedent decisions. Confer with persons or organizations involved and prepare written decisions.	33,000	Faster than average
Merchandise displayers and window trimmers	Plan and erect commercial displays, such as those in windows and interiors of retail stores and at trade exhibitions.	20,000	About as fast as average
Teachers, preschool	Teach preschool pupils in public or private schools basic physical, mental, and developmental skills.	278,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
TECHNOLOGISTS AND TECHNICIANS, EXCEPT HEALTH			
Radio operators	Receive and transmit communications, using radiotelegraph or radiotelephone equipment in accordance with government regulations. May repair equipment.	7,100	About as fast as average
Title examiners, searchers, and clerks	*Title examiners*: Search public records and examine titles to determine legal status of property titles. Copy or summarize (abstract) recorded documents, such as mortgages, trust deeds, and contracts, affecting title to property. May prepare and issue policy that guarantees legality of title. *Abstractors*: Summarize pertinent legal or insurance details or sections of statutes or case law from reference books for purpose of examination, proof, or ready reference. Search out titles to determine if title deed is correct. *Searchers*: Compile lists of mortgages, deeds, contracts, judgments, and other instruments pertaining to title by searching public and private records for real estate or title insurance company.	21,000	Faster than average
MARKETING AND SALES OCCUPATIONS			
Appraisers, real estate	Appraise improved or unimproved real property to determine its value for purchase, sale, investment, mortgage, or loan purposes.	38,000	About as fast as average
Counter and rental clerks	Receive articles and/or orders for services, such as rentals, repairs, drycleaning, and storage. May compute cost and accept payment.	96,000	Little change
Stock clerks, sales floor	Receive, store, and issue merchandise on sales floor. Stock shelves, racks, cases, bins, and tables with merchandise and arrange display of items to attract customers. May periodically take physical count of stock or check and mark merchandise.	574,000	About as fast as average
ADMINISTRATIVE SUPPORT OCCUPATIONS, INCLUDING CLERICAL			
Adjustment clerks	Investigate and resolve customer complaints concerning merchandise, service, billing, or credit rating. Examine pertinent information to determine accuracy of customer complaint and responsibility for errors. Notify customer and appropriate personnel of findings, adjustments, and recommendations, such as exchange of merchandise, refund of money, credit to customer's account, or adjustment of customer's bill.	65,000	Faster than average
Advertising clerks	Receive orders for classified advertising from customers in person or by telephone for newspapers or magazines. Examine and mark classified advertisements of newspapers according to copy sheet specifications to guide composing room in assembling type. Verify conformance of published advertisements to specifications for billing purposes.	11,000	Faster than average
Bill and account collectors	Locate and notify customers of delinquent accounts by mail, telephone, or personal visit to solicit payment. Duties include receiving payment and posting amount to customer's account; preparing statements to credit department if customer fails to respond; initiating repossession proceedings or service disconnection; keeping records of collection and status of accounts.	115,000	Faster than average

Title	Definition	Employment 1984	Projected growth 1984–95
Billing, cost, and rate clerks	Compile data, compute fees and charges, and prepare invoices for billing purposes. Duties also include computing costs and calculating rates for goods, services, and shipment of goods; posting data; and keeping other relevant records. May involve use of typing, adding, calculating, and bookkeeping machines.	216,000	About as fast as average
Billing, posting, and calculating machine operators	Operate machines that automatically perform mathematical processes, such as addition, subtraction, multiplication, division, and extraction of roots, to calculate and record billing, accounting, statistical, and other numerical data. Duties also include operating special billing machines, generally combination typing and adding machines, to prepare statements, bills, and invoices, and the operation of bookkeeping machines to copy and post data, make computations, and compile records of transactions.	234,000	About as fast as average
Brokerage clerks	Perform clerical duties involved with the purchase or sale of securities, determining value or changes to value of securities, and associated recordkeeping. Duties include writing orders for stock purchases and sales, computing transfer taxes, verifying stock transactions, accepting and delivering securities, informing customers of stock price fluctuations, computing equity, distributing dividends, and keeping records of daily transactions and holdings.	29,000	Faster than average
Court clerks	Perform clerical duties in court of law; prepare docket of cases to be called; secure information for judges and contact witnesses, attorneys, and litigants to obtain information for court.	33,000	Faster than average
Credit checkers	Investigate history and credit standing of individuals or business establishments applying for credit. Telephone or write given references to obtain information from credit departments of business and service establishments.	34,000	Faster than average
Customer service representatives, utilities	Interview applicants for water, gas, electric, or telephone service. Talk with customer by phone or in person and receive orders for installation, turn-on, discontinuance, or change in service.	92,000	About as fast as average
Dispatchers, except police, fire, and ambulance	Schedule and dispatch workers, work crews, equipment, or service vehicles for conveyance of materials, freight, or passengers or for normal installation, service, or emergency repairs rendered outside the place of business. Duties may include use of radio/telephone to transmit assignments and compiling statistics and reports on the progress of work.	144,000	About as fast as average
Dispatchers, police, fire, and ambulance	Receive complaints from public concerning crimes and police emergencies and broadcast orders to police radio patrol units in vicinity to investigate. Operate radio and telephone equipment to receive reports of fires and medical emergencies and relay information or orders to proper officials.	59,000	About as fast as average
Duplicating, mail, and other office machine operators	*Duplicating machine operators*: Operate one or a variety of duplicating machines to make copies of data. Machines frequently used are Dualith, Multilith, Masterlith, Mimeograph, Dupligraph, Multigraph, Compotype, and Xerox. *Transit clerks*: Sort, record, prove, and prepare transit items for mailing to or from out-of-city banks to insure correct routing and prompt collection.	153,000	About as fast as average
File clerks	File correspondence, cards, invoices, receipts, and other records in alphabetic or numerical order, or according to the filing system used. Locate and remove material from file when requested. May be required to classify and file new material.	289,000	Little change
General office clerks	Duties are varied and diverse and may include a combination of bookkeeping, typing, stenography, office machine operations, and filing.	2,398,000	Slower than average

Title	Definition	Employment 1984	Projected growth 1984–95
Hotel desk clerks	Register and assign hotel rooms to guests, issue room keys, transmit and receive messages, keep records of rooms occupied and guests' accounts, make and confirm reservations, and present statements to and collect payments from departing guests.	99,000	About as fast as average
Insurance adjusters, examiners, and investigators	Investigate, analyze, and determine the validity of the amount of insurance company's liability concerning personal, casualty, or property loss or damages, and effect settlement with claimants. Correspond with or interview medical specialists, agents, witnesses, or claimants to compile information. Calculate benefit payments and approve payment of claims within a certain monetary limit.	134,000	Faster than average
Insurance appraisers, auto damage	Appraise automobile or other vehicle damage to determine cost of repair for insurance claim settlement and seek agreement with automotive repair shop on cost of repair. Prepare insurance forms to indicate repair cost or cost estimates and recommendations.	7,000	About as fast as average
Insurance claims and policy processing clerks	*Claims clerks*: Obtain claims information from insured or designated persons to settle claims with insurance carrier. *Policy processing clerks*: Process applications for, changes to, reinstatements of, and cancellation of insurance policies. Duties include reviewing insurance applications to insure that all questions have been answered, compiling data on changes of insurance policies and changing policy records to conform to insured party's specifications, compiling data on lapsed insurance policies to determine automatic reinstatement according to company policies, canceling insurance policies as requested by agents, and verifying the accuracy of insurance company records.	125,000	About as fast as average
Library assistants and bookmobile drivers	Compile records; sort and shelve books; issue and receive library materials, such as pictures, cards, slides, phonograph records, and microfilm; and handle tape decks. Locate library materials for loan and replace material in shelving area (stacks) or files according to identification number and title. Register patrons to permit them to borrow books, periodicals, and other library materials. Bookmobile drivers operate a bookmobile or light truck that pulls a book trailer to specific locations on a predetermined schedule and assist with providing services in mobile library.	122,000	Slower than average
License clerks	Issue licenses or permits to qualified applicants. Obtain necessary information, record data, advise applicants on requirements, collect fees, and issue licenses. May perform oral, visual, written, or performance testing.	13,000	About as fast as average
Loan and credit clerks	Assemble documents, prepare papers, process applications, and complete transactions of individuals applying for loans and credit. *Loan clerks*: Review loan papers to insure completeness; operate typewriters to prepare correspondence, reports, and loan documents from draft; and complete transactions between loan establishments, borrowers, and sellers upon approval of loan. *Credit clerks*: Interview applicants to obtain personal and financial data, determine creditworthiness, process applications, and notify customers of acceptance or rejection of credit.	123,000	About as fast as average
Mail clerks, except mailing machine operators and postal service	Prepare incoming and outgoing mail for distribution. Duties include time stamping, opening, reading, sorting, and routing incoming mail; sealing, stamping, and affixing postage to outgoing mail or packages; and keeping necessary records and completed forms.	136,000	Little change
Messengers	Run errands and sort and deliver messages, documents, packages, and other items to offices or departments within an establishment or to other business concerns, traveling on foot or by bicycle, motorcycle, automobile, or public conveyance. May use telephone to complete assigned tasks.	67,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Meter readers, utilities	Read electric, gas, water, or steam consumption meters and record volume used by residential and commercial customers.	50,000	Slower than average
Municipal clerks	Duties include drafting agendas for town or city council, recording minutes of council meetings, answering official correspondence, keeping fiscal records and accounts, and preparing reports on civic needs.	19,000	Slower than average
New accounts clerks, banking	Interview persons desiring to open bank accounts. Explain banking services available to prospective customers, and assist them in preparing application form.	72,000	About as fast as average
Order clerks, materials, merchandise, and services	Receive and process incoming orders for materials, merchandise, or services such as repairs, installations, or rental of facilities. Additional duties include informing customers of receipt of order, prices, shipping dates, and delays; preparing contracts; and handling complaints.	297,000	About as fast as average
Order fillers, wholesale and retail sales	Fill customers' mail and telephone orders from stored merchandise in accordance with specifications on sales slips or order forms. Duties include computing prices of items, completing order receipts, keeping records of outgoing orders, requisitioning additional material, supplies, and equipment, and other related tasks.	226,000	Little change
Payroll and timekeeping clerks	Compute wages and post wage data to payroll records and/or keep a daily record showing employees' time of arrival and departure. Compute earnings from time sheets and work tickets, using calculator. Operate posting machine to compute and subtract deductions. Enter net wages on earnings record card, check stub, and payroll sheet.	207,000	Expected to decline
Personnel clerks, except payroll and timekeeping	Compile and keep personnel records. Record data for each employee such as address, weekly earnings, absences, amount of sales or production, supervisory reports on ability and on date of and reason for termination. Compile and type reports from employment records. File employment records. Search employee files and furnish information to authorized persons.	108,000	About as fast as average
Procurement clerks	Compile information and records to draw up purchase orders for procurement of material.	53,000	Slower than average
Production, planning, and expediting clerks	Duties involve coordinating and expediting the flow of work and materials within or between departments of an establishment according to production schedule. This includes reviewing and distributing production schedules and work orders, conferring with department supervisors to determine progress of work and completion dates, and compiling reports on progress of work and production problems. Duties may also include scheduling workers and estimating costs, routing and delivering parts to insure production quotas are met, and scheduling shipment of parts. May keep inventory of material in departments and insure that merchandise is shipped by vendor on promised date. May write special orders for services and merchandise.	214,000	Slower than average
Proofreaders and copy markers	Read transcript or proof of type to detect and mark for correction any grammatical, typographical, or compositional errors.	22,000	About as fast as average
Real estate clerks	Perform duties concerned with rental, sale, and management of real estate, such as typing copies of listings, computing interest owed or penalty payments, holding collateral in escrow, and checking due notices on taxes and renewal dates of insurance and mortgage loans.	17,000	About as fast as average
Statement clerks	Prepare and distribute bank statements to customers, answer inquiries, and reconcile discrepancies in records and accounts.	37,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Stock clerks, stockroom, warehouse, or yard	Receive, store, and issue materials, equipment, and other items from stockroom, warehouse, or storage yard. Keep records and compile stock reports.	788,000	Little change
Telegraph and teletype operators	Operate telegraphic typewriter, telegraph key, teletype machine facsimile, and related equipment to transmit and receive signals or messages. Prepare messages according to prescribed formats, and verify and correct errors in messages. May adjust equipment for proper operation.	7,500	Expected to decline
Traffic, shipping, and receiving clerks	Verify and keep records on incoming and outgoing shipments and prepare items for shipment. Duties include assembling, addressing, stamping, and shipping merchandise or material; receiving, unpacking, verifying, and recording incoming merchandise or material; and arranging for the transportation of products.	651,000	Slower than average
Weighers, measurers, checkers, and samplers, recordkeeping	Duties involve weighing, measuring, and checking materials, supplies, and equipment for the purpose of keeping relevant records. Also may collect and keep record of samples of products or materials.	37,000	Slower than average
Welfare eligibility workers and interviewers	Interview and investigate applicants and recipients to determine eligibility for social programs. Duties include recording and evaluating personal and financial data obtained from individuals; initiating procedures to grant, modify, deny, or terminate eligibility for various aid programs; authorizing amount of grants; and preparing reports. These workers generally receive specialized training and assist social service caseworkers.	59,000	About as fast as average

SERVICE OCCUPATIONS

Title	Definition	Employment 1984	Projected growth 1984–95
Ambulance drivers and attendants	Drive ambulance or assist ambulance driver in transporting sick, injured, or convalescent persons. Assist in lifting patients and rendering first aid. May be required to have Red Cross first-aid training certificate.	23,000	Slower than average
Amusement and recreation attendants	Perform one or more of the following duties at amusement or recreation facilities: Schedule use of recreation facilities, allocate equipment to participants in sporting events or recreational pursuits, collect fees, set pins, prepare billiard tables, provide caddying and other services for golfers, or operate carnival rides and amusement concessions.	149,000	Faster than average
Baggage porters and bellhops	Carry baggage for travelers at transportation terminals or for guests at hotels or similar establishments. Perform additional duties, such as assisting handicapped persons, running errands, delivering ice, and directing people to their desired destinations.	31,000	Slower than average
Bakers, bread and pastry	Mix and bake ingredients according to recipes to produce breads, pastries, and other baked goods in establishments where goods are produced in small quantities for consumption on premises or for sale as specialty baked goods.	68,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Cooks, short order and specialty fast food	*Short-order cooks*: Prepare and cook to order a variety of foods that require only a short preparation time. May take orders from customers and serve patrons at counters or tables. *Specialty fast-food cooks*: Prepare and cook food in a fast-food restaurant with a limited menu. The menu and duties of the cooks are limited to one or two basic items, such as hamburgers, chicken, pizza, tacos, or fish and chips. The duties of the cook normally involve operating large-volume single-purpose cooking equipment. Typically, these cooks work in national or regional fast-food chain restaurants.	425,000	About as fast as average
Crossing guards	Guide or control vehicular or pedestrian traffic at such places as street and railroad crossings and construction sites.	75,000	Slower than average
Dining room and cafeteria attendants and bartender helpers	Perform any combination of the following duties to facilitate food service: Carry dirty dishes from dining room to kitchen; replace soiled table linens and set tables with silverware and glassware; replenish supply of linens, silverware, glassware, and dishes; supply service bar with food, such as soups, salads, and desserts; and serve ice water and butter to patrons. May also serve coffee. May wash tables.	307,000	Faster than average
Food preparation and service workers, fast food	Duties include both food preparation and food service.	1,201,000	About as fast as average
Food preparation workers	Perform a variety of food preparation duties, in a restaurant kitchen or delicatessen, such as preparing cold foods and maintaining and cleaning kitchen work areas, equipment, and utensils. Perform simple tasks such as preparing shellfish or slicing meat. May brew coffee, tea, or chocolate or prepare sandwiches.	987,000	Faster than average
Hosts and hostesses, restaurant, lounge, and coffee shop	Welcome patrons, seat them at tables or in lounge, and insure quality of service.	132,000	Faster than average
Occupational therapy assistants and aides	Assist occupational therapists in administering medically oriented occupational program to assist in rehabilitating patients in hospitals and similar institutions.	8,000	About as fast as average
Pest controllers and assistants	Spray or release chemical solutions or toxic gases and set mechanical traps to kill pests and vermin, such as mice, termites, and roaches, that infest buildings and surrounding areas.	41,000	Little change
Pharmacy assistants	Mix pharmaceutical preparations under direction of pharmacist. Duties include issuing medicine, labeling and storing supplies, and cleaning equipment and work areas.	37,000	About as fast as average
Physical and corrective therapy assistants and aides	Prepare patients and/or administer physical therapy treatment, such as massages, heat, light and sound treatment, and traction. Instruct, motivate, and assist patients with learning and improving functional activities. Normally work under the direction of a physical or corrective therapist.	33,000	Faster than average
Private household workers	Perform household tasks such as cleaning, cooking, and caring for children.	993,000	Expected to decline
Social welfare service aides	Perform a variety of tasks at places of residence. Duties include keeping house; advising families having problems with such things as nutrition, health, cleanliness, and household utilities.	98,000	Faster than average
Ushers, lobby attendants, and ticket takers	Assist patrons at entertainment events, such as sporting events and motion picture performances. May assist in finding seats, searching for lost articles, and locating rest rooms and telephones. Collect admission tickets and passes from patrons.	42,000	Slower than average

Title	Definition	Employment 1984	Projected growth 1984–95
AGRICULTURAL, FORESTRY, AND FISHING OCCUPATIONS			
Animal caretakers, except farm	Feed, water, groom, exercise, or otherwise care for small or large animals, fish or birds in zoos, circuses, pounds, laboratories, animal hospitals, aquariums, kennels, or stables. Clean and repair cages, pens, or fish tanks. May administer tests to experimental animals or give treatments to sick or injured animals. May keep records of feedings, tests, and treatments, and of animals received and discharged.	69,000	About as fast as average
Farm workers	Perform a variety of the following duties: Plant, cultivate, harvest, and store crops; tend livestock and poultry; operate and maintain farm machinery; and maintain structures. May haul livestock and produce to market or terminal shipping point.	1,079,000	Expected to decline
Fishers, hunters, and trappers	*Captains and officers, fishing vessels*: Supervise and navigate fishing vessels. *Fishers*: Catch or gather marine life with nets, seines, or lines. Clean equipment and make repairs. *Hunters and trappers*: Breed, raise, and protect game animals. Search and catch wild birds and animals. Hunt predatory animals.	46,000	Expected to decline
Forestry and logging occupations	*Choke setters*: Fasten chokers around logs preparatory to yarding them from falling-bucking area to storage or loading landing. *Fallers and buckers*: Fell and/or saw trees into specified log lengths. *Forest conservation workers*: Develop, maintain, and protect forested areas and woodlands through such activities as raising and transplanting tree seedlings; combating insects, pests, and diseases harmful to trees; and controlling erosion and leaching of forest soil. *Logging tractor operators*: Drive tractor equipped with one or more accessories, such as bulldozer blade, frontal hydraulic shear, grapple, logging arch, cable winches, hoisting rack, or crane boom to fell trees, to skid, load and unload, or stack logs, or to pull stumps and/or clear brush. *Log graders and scalers*: Grade logs, or estimate the marketable content or value of logs or pulpwood in sorting yards, millponds, log decks, or similar locations. Inspect logs for defects or measure logs to determine volume. *Log handling equipment operators*: Operate track or wheel type log handling equipment to unload log trucks and/or gondolas and deck logs by species, size, and sort. May move logs by species, size, and sort. May move logs from storage area to deck sawyer or barker area. Usually work in "dry pond" areas, but may unload logs and drop in pond.	135,000	Expected to decline
Gardeners and groundskeepers, except farm	Maintain grounds of public or private property using hand and power tools or equipment. May perform any combination of tasks, such as mowing, trimming, planting, watering, fertilizing, digging, raking, and sweeping. Additional duties may include minimal care and upkeep of buildings and equipment. May plan and execute small-scale landscaping operations. May dig and prepare graves.	650,000	About as fast as average
Graders and sorters, agricultural products	Grade, sort, or classify unprocessed food and other agricultural products by size, weight, color, or condition.	21,000	Slower than average
Nursery workers	Work in nursery facilities planting, cultivating, harvesting, and transplanting trees, shrubs, or plants.	20,000	Little change
Supervisors, agricultural, forestry, fishing, and related occupations	Directly supervise and coordinate the activities of agricultural, forestry, fishing, and related workers. May supervise helpers assigned to these workers.	82,000	Expected to decline

Title	Definition	Employment 1984	Projected growth 1984–95
CONSTRUCTION AND EXTRACTIVE OCCUPATIONS			
Air hammer operators	Break asphalt, concrete, stone, or other pavement; loosen earth, dig clay, or break rock to trim bottom or sides of trenches or other excavations; drill holes in concrete; reduce size of large stones; or tamp earth in backfill using air hammer.	9,800	Slower than average
Blasters and explosives workers	Place explosives in holes or other spots and detonate the explosives to loosen, remove, or displace earth, rock, or other materials, or to demolish structures.	9,600	Little change
Ceiling tile installers and acoustical carpenters	Apply or mount acoustical tiles, blocks, strips, or sheets of shock absorbing materials to ceilings and walls of buildings to reduce or reflect sound.	25,000	About as fast as average
Continuous mining machine operators	Operate self-propelled mining machines that rip coal from the face and load it onto conveyors or into shuttle cars in a continuous operation.	6,500	Slower than average
Derrick operators, oil and gas extraction	Rig derrick equipment and operate pumps to circulate mud through drill hole.	15,000	Slower than average
Highway maintenance workers	Maintain highways, municipal and rural roads, airport runways, and rights-of-way in safe condition by patching broken or eroded pavement or erecting and repairing guard rails, highway markers, and snow fences. May also clear brush or plant trees along rights-of-way.	143,000	Slower than average
Mine cutting and channeling machine operators	Cut or channel along the face or seams of coal, quarry stone, or other mining surfaces to facilitate blasting, separating, or removing minerals or materials from mines or from the earth's surface.	11,000	Expected to decline
Pipelayers and pipelaying fitters	*Pipelayers*: Lay glazed or unglazed clay, concrete, plastic, or cast-iron pipe for storm or sanitation sewers, drains, water mains, and oil or gas lines, performing any combination of the following tasks: Grade trenches or culverts, position pipe, or seal joints. *Pipelaying fitters*: Align pipeline section preparatory to welding. Signal tractor driver in placing pipeline sections in proper alignment and insert steel spacers.	48,000	About as fast as average
Rotary drill operators, oil and gas extraction	Set up or operate a variety of drills to remove petroleum products from the earth and to remove core samples for testing during oil and gas exploration.	24,000	Slower than average
MECHANICS AND REPAIRERS			
Electrical installers and repairers, transportation equipment	Install, adjust, and maintain electrical systems, wiring switches, and fixtures on motor vehicles, trains, or aircraft.	5,600	About as fast as average
Electric meter installers and repairers	Install electric meters on pole or customer's premises, test meters, make necessary repairs, and turn current on/off by connecting or disconnecting service drop.	9,100	About as fast as average
Electric motor, transformer, and related repairers	Install, repair, and maintain electric motors, batteries, transformers, wiring, and switchers.	25,000	Faster than average

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Title	Definition	Employment 1984	Projected growth 1984–95
Electromedical and biomedical equipment repairers	Test, adjust, and repair electromedical equipment.	6,900	About as fast as average
Machinery maintenance workers	Perform work involving maintenance of production machinery, such as changing parts and lubricating machinery.	61,000	Slower than average
Mobile home repairers	Install, repair, and maintain units and systems in mobile homes, prefabricated buildings, or travel trailers.	10,000	Slower than average
Rail car repairers	Repair and rebuild railway freight cars, tank cars, or locomotives, following Federal and company regulations and specifications.	27,000	Expected to decline
Precision instrument repairers	Install, test, repair, maintain, and adjust indicating, recording, telemetering, and controlling instruments used to measure and control variables such as pressure, flow, temperature, motion, force, and chemical composition.	57,000	About as fast as average
Riggers	Set up or repair rigging for ships and shipyards, manufacturing plants, construction projects, and for the entertainment industry. Select cables, ropes, pulleys, winches, blocks, and sheaves according to weight and size of load to be moved. Coordinate and direct other workers and the movement of equipment to accomplish the task.	22,000	About as fast as average
Small engine specialists	Repair and maintain the operation and equipment of nonautomobile gasoline-powered internal combustion engines including outboard motors, snowmobiles, lawnmowers, and chainsaws.	33,000	About as fast as average
Tire repairers and changers	Repair and replace tires, tubes, treads, and related products on automobiles, buses, trucks, and other vehicles. Duties include mounting tires on wheels, balancing tires and wheels, and testing and repairing damaged inner tubes.	85,000	About as fast as average
Watchmakers	Repair, clean, and adjust mechanisms of instruments such as watches, time clocks, and timing switches.	14,000	Slower than average
PRODUCTION OCCUPATIONS			
Bakers, manufacturing	Mix and bake ingredients according to recipes to produce breads, pastries, and other baked goods. Goods are produced in large quantities for sale through establishments such as grocery stores. Generally high-volume production equipment is used.	48,000	Little change
Boiler operators and tenders, low pressure	Operate or tend low-pressure stationary steam boilers and auxiliary steam equipment, such as pumps, compressors, and air-conditioning equipment, to supply steam heat for office buildings, apartment houses, or industrial establishments; to maintain steam at specified pressure aboard marine vessels; or to generate and supply compressed air for operation of pneumatic tools, hoists, and air lances.	44,000	Slower than average
Cabinetmakers and bench carpenters	Cut, shape, and assemble wooden articles, such as store fixtures, office equipment, cabinets, and high-grade furniture. Set up and operate a variety of machines, such as power saws, jointers, mortisers, tenoners, molders, and shapers to cut and shape parts from wood stock.	99,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Cannery workers	Perform any of a variety of routine tasks in canning, freezing, preserving, or packing food products. Duties may include sorting, grading, washing, peeling, trimming, or slicing agricultural produce.	77,000	Expected to decline
Cementing and gluing machine operators and tenders	Operate or tend cementing and gluing machines to join together items, such as veneer sheets into plywood; paper to glass-wool, cardboard, or paper; rubber and rubberized fabric parts; plastic; and simulated leather or other materials, to form completed product or to form product for further processing.	45,000	Little change
Chemical equipment controllers, operators, and tenders	*Controllers and operators*: Control or operate equipment to control chemical changes or reactions in the processing of industrial or consumer products. Typical types of equipment are reaction kettles, catalytic converters, continuous or batch treating equipment, saturator tanks, electrolytic cells, reactor vessels, recovery units, and fermentation chambers. *Tenders*: Tend equipment in which a chemical change or reaction takes place. Typical types of equipment are devulcanizers, batch stills, fermenting tanks, steam-jacketed kettles, and reactor vessels, to process chemical substances into industrial or consumer products.	57,000	Little change
Chemical plant and system operators	Control and operate an entire chemical process or system of machines, such as reduction pots and heated air towers, through the use of panelboards, controlboards, or semiautomatic equipment.	35,000	Slower than average
Combination machine-tool setters, setup operators, and tenders	*Setters and setup operators*: Set up or set up and operate more than one type of cutting or forming machine tool, such as gear hobbers, lathes, press brakes, shearing, and boring machines. *Operators and tenders*: Operate or tend more than one type of cutting or forming machine tool which has been previously set up, such as band saws, press brakes, slitting machines, drills, lathes, and boring machines.	108,000	Faster than average
Cooking machine operators and tenders, food	Operate or tend cooking equipment, such as steam cooking vats, deep fry cookers, pressure cookers, kettles, and boilers, to prepare food products, such as meats, sugar, cheese, and grain.	14,000	Expected to decline
Crushing and mixing machine operators and tenders	*Crushing, grinding, and polishing machine operators and tenders*: Operate or tend machines to crush or grind a wide variety of materials, such as coal, glass, plastic, dried fruit, grain, stone, chemicals, food, or rubber, or operate or tend machines that buff and polish materials or products, such as stone, glass, slate, plastic or metal trim, bowling balls, or eyeglasses. *Mixing and blending machine operators and tenders*: Operate or tend machines to mix or blend any of a wide variety of materials, such as spices, dough batter, tobacco, fruit juices, chemicals, livestock feed, food products, color pigments, or explosive ingredients.	122,000	Little change
Custom tailors and sewers	Design, make, alter, repair, and fit made-to-measure or ready-to-wear garments applying knowledge of garment construction, fabrics, and sewing.	127,000	Slower than average
Cutters and trimmers, hand	Cut and trim any of a wide variety of manufactured items, such as stone, glass, rubber, or fabrics, using handtools or hand-held power tools.	49,000	Expected to decline
Cutting and slicing machine operators and tenders	Operate or tend machines to cut or slice any of a wide variety of products or materials, such as tobacco, food, paper, roofing slate, glass, stone, rubber, cork, and insulating material.	61,000	Little change
Dairy processing equipment operators and tenders	Set up, operate, or tend continuous flow or vat-type equipment to process milk, cream, or other dairy products following specified methods and formulas.	16,000	Expected to decline

Title	Definition	Employment 1984	Projected growth 1984–95
Electrical and electronics assemblers	Perform work at a level less than that required of the precision level. Includes such occupations as electronics wirers, armature connectors, electric motor winders, skein winders, carbon brush assemblers, battery parts assemblers, electric sign assemblers, and electronics assemblers.	259,000	About as fast as average
Electrolytic plating machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend electrolytic plating or coating machines, such as zincplating machines and anodizing machines, to coat metal or plastic products electrolytically with chromium, zinc, copper, cadmium, or other metal to provide protective or decorative surfaces or to build up worn surfaces according to specifications. *Setters and setup operators*: Set up and operate electrolytic plating or coating machines, such as continuous multistrand electrogalvanizing machines, to coat metal or plastic products electrolytically with chromium, copper, cadmium, or other metal to provide protective or decorative surfaces or to build up worn surfaces according to specifications.	28,000	About as fast as average
Electronic semiconductor processors	Process materials used in the manufacture of electronic semiconductors; load semiconductor material into furnace; saw formed ingots into segments; load individual segment into crystal growing chamber and monitor controls; locate crystal axis in ingot using X-ray equipment and saw ingots into wafers; clean, polish, and load wafers into series of special-purpose furnaces, chemical baths, and equipment used to form circuiting and change conductive properties. May scribe or separate wafer into dice.	30,000	Faster than average
Etchers and engravers	Engrave and etch metal, wood, rubber, glass, or other materials by hand or machine for printing, identification, or decorative purposes.	8,900	About as fast as average
Extruding and forming machine operators and tenders	Operate or tend machines to shape and form any of a wide variety of manufactured products, such as glass bulbs, molded food and candy, rubber goods, clay products, wax products, tobacco plugs, cosmetics, or paper products, by means of extruding, compressing, or compacting.	71,000	Slower than average
Extruding and forming machine operators and tenders, synthetic fibers	Operate or tend machines that extrude and form continuous filaments from synthetic materials, such as liquid polymer, rayon, and fiberglass, preparatory to further processing.	19,000	Expected to decline
Food batchmakers	Set up and operate equipment that mixes, blends, or cooks ingredients used in manufacturing of food products according to formulas or recipes. May modify or reformulate recipes to produce products of specific flavor, texture, and color.	21,000	Expected to decline
Foundry mold and core makers	Make and form sand cores and molds used in the production of metal castings in foundries using hand and power tools and applying knowledge of variables, such as metal characteristics, molding sand, contour of patterns, reinforcing, and pouring procedures.	22,000	Little change
Foundry mold assemblers and shakeout workers	Prepare molds for pouring, such as cleaning and assembling foundry molds, assembling cores in fixture of automatic core-sorting machine, and bonding cope and drags together to form completed shell mold.	6,000	Expected to decline

Title	Definition	Employment 1984	Projected growth 1984–95
Furnace, kiln, or kettle operators	*Oven operators or tenders*: Operate or tend heating equipment other than basic metal or plastic processing equipment. Perform such operations as baking fiberglass or painted products, fusing glass or enamel to metal products, carbonizing coal, or curing rubber or other products. *Furnace operators or tenders*: Perform such operations as annealing glass, roasting sulfur, converting chemicals, or processing petroleum. *Kettle operators and tenders*: Perform such operations as boiling soap or melting antimony or asphalt materials. *Drier operators and tenders*: Perform such operations as removing moisture from paper, chemicals, ore, clay products, or slurry. *Kiln operators and tenders*: Perform such operations as heating minerals, drying lumber, firing greenware, annealing glassware, or baking clay products.	63,000	Expected to decline
Furnace operators and tenders	Operate or control gas, oil, coal, electric-arc or electric induction, open hearth, or oxygen furnaces to melt and refine metal prior to casting or to produce specified types of steel.	22,000	Little change
Furniture finishers	Perform precision tasks in shaping, finishing, or refinishing damaged, worn, or used furniture or new high-grade furniture to specified color or finish where specialized knowledge of wood properties, finishes, and furniture style is required.	34,000	Slower than average
Gaugers	Gauge and test oil in storage tanks and regulate flow of oil into pipelines at wells, tank farms, refineries, and marine and rail terminals following prescribed standards and regulations.	5,700	Expected to decline
Hand workers, jewelry and related products	Perform such operations as precision casting and modeling of molds, casting metal in molds, and setting precious and semiprecious stones for jewelry, silverware, plate ware, ornamental figurines, trophies, and plaques. May make gold or silver chains and cut designs or lines in jewelry.	8,800	Expected to decline
Head sawyers	Operate head saws and feed carriages to saw logs into rough cants or boards from heading bolts.	10,000	Little change
Heaters, metal and plastic	Operate or control soaking pits, reheating furnaces, and heating and vacuum equipment to heat metal sheets, blooms, billets, bars, plate, and rods to specified temperature for rolling or processing or to treat and cure preformed plastic parts.	5,500	Slower than average
Heating equipment setters and setup operators	Set up and operate heat-treating furnaces, flame-hardening machines and induction machines, that anneal or heat-treat metal objects according to specifications.	7,600	Slower than average
Heat-treating machine operators and tenders	Operate and tend furnaces, baths, flame-hardening machines, and electronic induction machines to harden, anneal, and heat-treat metal products or metal parts.	21,000	Slower than average
Inspectors, testers, and graders	Perform precision inspecting, testing, and grading of parts, products, and equipment for defects, wear, and deviations from specifications. May make minor repairs.	254,000	About as fast as average
Laundry and drycleaning machine operators and tenders, except pressers	Operate and tend washing or drycleaning machines to clean, or dryclean commercial, industrial, or household articles, such as suede, leather, and cloth garments, furs, blankets, draperies, fine linens, rugs, and carpets.	125,000	About as fast as average
Layout workers, metal	Lay out reference points or dimensions on structural steel shapes or plates and metal stock or workpieces, such as casting, plates, tubes, or machine parts, to indicate processing to be done, such as machining, fabricating, welding, and assembling.	21,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Machine assemblers	Perform work at a level less than that required of the precision level. Includes such occupations as air-conditioning coil assemblers, ball bearing ring assemblers, fuel injection assemblers, and subassemblers.	51,000	About as fast as average
Meat, poultry, and fish cutters	Perform a wide variety of food cutting and trimming tasks, using handtools, that require skills less than that of the precision level. Includes such occupations as meat boners, carcass slitters, poultry eviscerators, fish cleaners and butchers, skinners, and stickers.	98,000	Expected to decline
Metal fabricators, structural metal products	Fabricate and assemble structural metal products such as frameworks or shells for machinery, ovens, tanks, stacks, and metal parts for buildings and bridges according to job orders or blueprints.	44,000	Faster than average
Metal molding machine operators, tenders, setters, and setup operators	*Operators and setters*: Operate or tend metal molding, casting, or coremaking machines, such as centrifugal casting machines, vacuum casting machines, turnover draw-type coremaking machines, conveyor-screw coremaking machines, and diecasting machines, to mold or cast metal products, such as pipes, brakedrums, and rods, and metal parts, such as automobile trim, carburetor housings, and motor parts. *Setters and setup operators*: Set up and operate diecasting and casting machines, molding and coremaking machines, such as roll-over, squeeze, and shell molding machines to mold or cast metal products, such as tubes and rods, and metal parts, such as automobile trim, carburetor housings, and motor parts.	20,000	Slower than average
Metal pourers and casters, basic shapes	Pour and regulate the flow of molten metal into molds to produce castings or ingots of specified quality and size by operating hand controlled mechanisms adjunctive to specialized machinery and equipment.	12,000	Little change
Molders and casters, hand	Mold and cast using handtools or hand-held power tools any of a wide variety of items, such as food products, lamps, figurines, ashtrays, tile, pipes, mannequins, and candles.	17,000	Little change
Molders and shapers, except jewelry and foundry	Mold, shape, cast, or carve products consisting of clay, glass, plaster, concrete, and stone, or combinations of materials, into semifinished or finished products.	10,000	Slower than average
Motion picture projectionists	Set up and operate motion picture projection and sound-reproducing equipment to produce coordinated effects on screen.	16,000	Expected to decline
Nonelectrolytic plating machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend nonelectrolytic plating or coating machines, such as metal spraying machines and vacuum metalizing machines, to coat metal or plastic products or parts with metal. *Setters and setup operators*: Set up or set up and operate nonelectrolytic plating or coating machines, such as hot-dip lines and metal spraying machines, to coat metal or plastic products or parts with metal.	6,300	Faster than average
Packaging and filling machine operators	Operate or tend machines, such as filling machines, casing running machines, ham rolling machines, preservative filling machines, baling machines, wrapping machines, and stuffing machines to prepare industrial or consumer products, such as gas cylinders, meat and other food products, tobacco, insulation, ammunition, stuffed toys and athletic equipment, and upholstered pads, as end products or for storage and shipment.	369,000	Slower than average
Painting, coating, and decorating workers	Paint, coat, and decorate using handtools or hand-held power tools a wide variety of manufactured items, such as furniture, glass and plateware, lamps, jewelry, books, or leather products.	41,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Painting machine operators and tenders	*Coating machine operators or tenders*: Operate or tend machines to coat any of a wide variety of items, such as coating food products with sugar, chocolate, and butter, coating paper and paper products with chemical solutions, wax, and glazes, or coating fabric with rubber or plastic. *Painting and spraying machine operators and tenders*: Operate or tend machines to spray or paint decorative, protective, or other finish or coating, such as adhesive, lacquer, paint, stain, latex, preservative, or oil, to any of a wide variety of items or materials, such as wood and wood products, ceramics, and glass. This occupation includes workers who apply coating or finish to products with solutions or materials preparatory to consumer use or further processing.	69,000	Slower than average
Paper goods machine setting and setup operators	Set up or set up and operate paper goods machines that perform a variety of functions, such as converting, sawing, corrugating, banding, wrapping, boxing, stitching, forming, or sealing paper or paperboard sheets into products, such as toilet tissue, towels, napkins, bags, envelopes, tubing, cartons, wax rolls, and containers.	60,000	Little change
Pattern and model makers, metal and plastic	*Patternmakers*: Lay out, machine, fit, and assemble castings and parts to metal foundry patterns, core boxes, and match plates, and analyze specifications according to knowledge of patternmaking methods. *Model makers*: Set up and operate machines such as model maker's lathe, milling, and engraving machines and jig borers to make working models of metal or plastic objects.	13,000	Little change
Pattern and model makers, wood	*Patternmakers*: Plan, lay out, and construct wooden unit or sectional patterns used in forming sand molds for casting according to blueprint specifications. *Model makers*: Construct full-sized and scale wooden precision models of products, such as boats, automobiles, household appliances, aircraft, and machinery.	12,000	About as fast as average
Patternmakers and layout workers, fabric and apparel	Draw and construct sets of precision master patterns or layouts and mark and cut fabrics and apparel according to blueprints or specifications.	14,000	Expected to decline
Patternmakers, model makers, layout workers, and cutters	Construct patterns and models for use in forming products composed of single materials (except metal, plastic, wood, or textiles) or a combination of materials.	6,700	Slower than average
Petroleum refinery and control panel operators	Analyze specifications or follow process schedules to operate and control continuous petroleum refining and processing units.	15,000	Expected to decline
Plastic molding machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend plastic molding machines, such as compression or injection molding machines to mold, form, or cast plastic products to specified shape from thermoplastic materials. *Setters and setup operators*: Set up or set up and operate plastic molding machines, such as compression or injection molding machines, to mold or cast products to specified shapes from thermoplastic materials.	35,000	Faster than average
Portable machine cutters	Cut multiple layers of fabric into parts for articles, such as awnings, fitted sheets, garments, hats, stuffed toys, and upholstered furniture, using portable electric cutter.	18,000	Expected to decline
Power distributors and dispatchers	Coordinate, regulate, or distribute electricity or steam in generating stations and substations and over electric power lines. May work for utility company or in large industrial establishments. In addition to distributing power, some time may be spent generating power.	26,000	About as fast as average

Title	Definition	Employment 1984	Projected growth 1984–95
Pressers, hand	Press drapes, knit goods, millinery parts, parachutes, garments, and slipcovers, or delicate textiles, such as lace, rayons, and silks, to remove wrinkles, flatten seams, and give shape to articles. May block (shape) knitted garments after cleaning. May press leather goods.	22,000	Expected to decline
Pressing machine operators and tenders, textiles	Operate or tend pressing machines, such as hot-head pressing, steam pressing, automatic pressing, ironing, plunger pressing, and hydraulic pressing machines, to press and shape articles, such as leather, fur, and cloth garments, or drapes, slipcovers, handkerchiefs, and millinery.	116,000	Expected to decline
Roasting machine operators and tenders, food	Operate or tend roasting, baking, or drying equipment, such as hearth ovens, kiln driers, roasters, char kilns, steam ovens, and vacuum drying equipment to reduce moisture content of tobacco or food products, such as cocoa, coffee beans, macaroni, and grain: to roast grain, nuts, or coffee beans; to bake bread or other bakery products; or to process food preparatory to canning.	12,000	Expected to decline
Sawing machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend wood sawing machines, such as circular saws, band saws, multiple blade sawing machines, scroll saws, ripsaws, equalizer saws, power saws, and crozer machines, to saw logs to specifications, cut lumber to specified dimensions, saw curved or irregular designs, trim edges and remove defects from lumber, and to cut grooves, bevel, and miter according to specifications and work orders. *Setters and setup operators*: Set up or set up and operate machines to saw wood. Examine blueprints, drawings, work orders, and patterns to determine size and shape of items to be sawed, sawing machines to set up, and sequence of sawing operations.	54,000	Slower than average
Screen printing setters and setup operators	Set up or set up and operate screen printing machines to print designs onto articles and materials, such as glass or plastic containers or ware, cloth, and paper.	15,000	Slower than average
Separating and still machine operators and tenders	Operate or tend machines, such as filter presses, shaker screens, centrifuges, condensor tubes, precipitator tanks, fermenting tanks, evaporating tanks, scrubbing towers, and batch stills, to extract, sort, or separate liquids, gases, or solid materials from other materials in order to recover a refined product or material.	24,000	Little change
Sewers, hand	Sew, join, reinforce, or finish, usually with needle and thread, any of a wide variety of manufactured items, such as hats, umbrellas, rugs, baseballs, and hosiery.	16,000	Expected to decline
Sewing machine operators, garment	Operate or tend sewing machines to perform joining and sewing operations, such as reinforcing, decorating garments or garment parts, and making or tacking buttonholes.	676,000	Expected to decline
Sewing machine operators, nongarment	Operate or tend sewing machines to join together, reinforce, decorate, or perform related sewing operations in the manufacture of nongarment products, such as upholstery, draperies, linens, carpets, and mattresses.	136,000	Little change
Shoe sewing machine operators and tenders	Operate or tend single, double, or multiple-needle stitching machines to join or decorate shoe parts, reinforce shoe parts, or attach buckles.	33,000	Expected to decline
Shipfitters	Lay out and fabricate metal structural parts, such as plates, bulkheads, and frames, and brace them in position within hull or ship for riveting or welding. May prepare molds and templates for fabrication of nonstandard parts.	14,000	Slower than average

Title	Definition	Employment 1984	Projected growth 1984–95
Soldering and brazing machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend soldering and brazing machines that braze, solder, or spot-weld fabricated metal products or components as specified by work orders, blueprints, and layout specifications. *Setters and setup operators*: Set up and operate soldering or brazing machines to bronze, solder, heat-treat, or spot-weld fabricated metal products or components as specified by work orders, blueprints, and layout specifications.	9,200	About as fast as average
Textile bleaching and dyeing machine operators and tenders	Operate or tend machines, such as padding machines, treating tanks, dye jigs, and vats, to bleach, shrink, wash, dye, and finish textiles, such as knitted garments, cloth, yarn, greige cloth, and fiberglass sliver, preparatory to further processing.	23,000	Expected to decline
Textile draw-out machine operators and tenders	Operate and tend machines, such as slubber machines and drawing frames, that draw out and combine sliver, such as wool, hemp, synthetic, and blended sliver, preparatory to further processing.	16,000	Expected to decline
Textile machine operators, tenders, and setup operators	*Operators and tenders*: Operate or tend machines that perform textile processing and manufacturing operations, such as winding, twisting, knitting, weaving, and cutting. *Setters and setup operators*: Set up or set up and operate machines that perform textile processing and manufacturing operations, such as winding, twisting, knitting, weaving, bonding, and stretching.	220,000	Expected to decline
Tire building machine operators	Operate machines, such as collapsible drum devices, to build pneumatic tires from rubber components, such as beads, ply stock, tread, and sidewalls.	13,000	Expected to decline
Welding machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend welding machines that join or bond together parts of fabricated metal products and metal components, such as panels, frames, yokes, tubes, and containers according to specifications and blueprints. *Setters and setup operators*: Set up and operate welding machines that join or bond together parts of fabricated metal products and metal components, such as panels, frames, yokes, tubes, and containers according to specifications and blueprint.	63,000	About as fast as average
Wood machinists	Set up and operate a variety of woodworking machines to surface, cut, and shape lumber, and to fabricate parts for wood products, such as door and window frames, furniture, and sashes, according to specifications.	45,000	About as fast as average
Woodworking machine operators, tenders, setters, and setup operators	*Operators and tenders*: Operate or tend woodworking machines, such as drill presses, lathes, shapers, routers, sanders, planers, and wood nailing machines, to perform woodworking operations. *Setters and setup operators*: Set up or set up and operate woodworking machines, such as lathes, drill presses, sanders, shapers, and planing machines, to perform woodworking operations.	49,000	Slower than average

TRANSPORTATION AND MATERIAL MOVING OCCUPATIONS

Title	Definition	Employment 1984	Projected growth 1984–95
Captains, water vessel	Command vessels, such as tugboats, ferryboats, or dredges, that travel into and out of harbors, estuaries, straits, sounds, rivers, lakes, bays, and oceans. Must hold license issued by U.S. Coast Guard.	18,000	About as fast as average
Conveyor operators and tenders	Control and tend conveyor systems that move materials or products to and from stockpiles, processing stations, departments, vehicles, and underground workings. May control speed and routing of materials or products.	38,000	Little change

Title	Definition	Employment 1984	Projected growth 1984–95
Locomotive engineers	Drive electric, diesel-electric, steam, or gas-turbine-electric locomotives, interpreting train orders, block or semaphore signals, and railroad rules and regulations to transport passengers or freight.	14,000	Expected to decline
Locomotive firers	Monitor locomotive instruments and watch for dragging equipment, obstacles on right-of-way, and train signals during run. Watch for and relay traffic signals from yard workers to yard engineers in railroad yard.	6,400	Expected to decline
Loading machine operators, underground mining	Operate underground loading machines to load coal, ore, or rock into shuttle or mine car or onto conveyors. Load power shovels, hoist engines equipped with cable drawn scrapers or scoops, or machine equipped with gathering arms and conveyors.	6,100	Little change
Mates and able seamen	*Mates, ship, boat, and barge*: Supervise and coordinate activities of crew aboard ships, boats, barges, or dredges. *Able seamen*: Stand watch at bow to look for obstructions in path of vessel, measure water depth, turn wheel on bridge, break out, rig, and overhaul and store cargo-handling gear, and chip rust from and paint deck or ship's structure.	11,000	Slower than average
Oil pumpers, except wellhead	Operate steam, gas, gasoline, electric, or diesel pumps and auxiliary equipment to restore and control flow of oil from wells.	16,000	Expected to decline
Ordinary seamen and marine oilers	Stand deck department watch and perform a variety of tasks to preserve the painted surface of the ship and to maintain lines and ship equipment. May oil and grease moving parts of engines and auxiliary equipment.	18,000	About as fast as average
Parking lot attendants	Park autos for customers in parking lot or storage garage.	40,000	Little change
Railroad brake, signal, and switch operators	Operate railroad track switches or couple/uncouple rolling stock to make up or break up trains. Signal engineers and set warning signals. May inspect couplings, air hoses, journal boxes, and hand brakes.	48,000	Expected to decline
Railroad conductors and yardmasters	*Conductors*: Coordinate activities of train crew engaged in transporting or providing services to passengers on passenger train, in transporting freight on freight train, or coordinate activities of switch-engine crew engaged in switching railroad cars within yard of railroad, industrial plant, or similar location. *Yardmasters*: Coordinate railroad traffic activities of workers engaged in makeup or breakup of trains, switching inbound or outbound traffic of railroad yard or railroad traffic on a specified section of line.	24,000	Expected to decline
Rail yard engineers, dinkey operators, and hostlers	Drive switching or other locomotive or dinkey engines within yard of railroad, industrial plant, quarry, construction project, or similar location.	15,000	Expected to decline
Service station attendants	Service automobiles, buses, trucks, boats, and other automotive or marine vehicles with fuel, lubricants, and accessories. May lubricate vehicle and change motor oil, replace lights, windshield wiper blades, or fan belts, or install antifreeze. May repair or replace tires and collect payment for services and supplies.	303,000	Little change
Ship engineers	Supervise and coordinate activities of crew engaged in operating and maintaining engines, boilers, deck machinery, and electrical, refrigeration, and sanitary equipment aboard ship.	10,000	Slower than average
Shuttle car operators	Operate diesel or electrically powered shuttle car in underground mine to transport materials from working face to mine cars or to conveyor.	9,300	Expected to decline

Title	Definition	Employment 1984	Projected growth 1984–95
Subway and streetcar operators	Operate elevated suburban or subway train or electric powered streetcar to transport passengers.	5,800	About as fast as average
Taxi drivers and chauffeurs	Drive automobiles, limousines, custom-built sedans, or hearses. May drive automobiles for delivery.	118,000	About as fast as average
Wellhead pumpers	Operate power pumps and auxiliary equipment to produce artificial flow of oil or gas from wells in oil field.	9,100	Little change
HANDLERS, EQUIPMENT CLEANERS, HELPERS, AND LABORERS			
Hand packers and packagers	Pack or package by hand a wide variety of products and materials.	325,000	Slower than average
Helpers, extractive workers	Help extractive craft workers such as earth drillers, blaster and explosives workers, derrick operators, and mining machine operators, by performing duties of lesser skill, supplying equipment, and cleaning work area.	29,000	Slower than average
Machine feeders and offbearers	Feed materials into machine or remove materials from machines or equipment that is automatic or tended by other workers.	278,000	Slower than average
Refuse collectors	Collect and dump refuse from containers into trucks on a designated route in a municipality. May drive trucks.	99,000	About as fast as average
Vehicle washers and equipment cleaners	Wash and clean vehicles, machinery, and other equipment using water, cleaning agents, brushes, cloths, and hoses.	144,000	Slower than average

Appendix B. Assumptions and Methods Used in Preparing Employment Projections

The discussions of future employment presented in the *Handbook* are couched in qualitative terms but are based on quantitative data derived through the Bureau's employment projections model system. Like other models used in projecting economic and employment growth, the Bureau's system encompasses the major facets of the economy and represents a comprehensive view of its projected structure. It comprises a series of closely related projections of the labor force, gross national product (GNP), industrial output and productivity, average weekly hours of work, and employment for detailed industries and occupations. A detailed description of the model system appears in *Employment Projections for 1995: Data and Methods*, Bulletin 2253.

The analyses developed through use of the models were prepared by Bureau staff. In addition, experts from other government agencies, industry, unions, professional societies, and trade associations furnished data and supplied information. Many of these individuals also reviewed preliminary drafts of the statements. Each occupational statement thus reflects the knowledge and judgment not only of the staff of the Bureau of Labor Statistics, but also of authorities in the fields discussed. The Bureau, of course, takes full responsibility for the published material.

Assumptions. To allow for the uncertainty of the future, the Bureau prepared three scenarios of future economic growth. The scenario underlying the information presented in the *Handbook* is the moderate-growth projection, characterized by strong growth in productivity and investment, a declining unemployment rate, and an annual rate of growth in real GNP of 2.9 percent between 1984 and 1995. Two alternatives to the moderate-growth projection were also developed: (a) higher productivity and lower unemployment (high growth), and (b) lower productivity and higher unemployment (low growth). In all three scenarios, annual rates of growth in GNP and employment slow in the latter half of the projection period—reflecting a slowdown in population and labor force growth after 1990.

The differences among the scenarios reflect different sets of specific assumptions about fiscal and monetary policy. These result in higher or lower levels of GNP and its components, such as investment and personal consumption expenditures. While these alternative projections give some idea of how employment could vary under different assumptions, actual growth could be outside the range of the alternatives. Furthermore, unforeseen changes in spending patterns—for example, in defense budgets or in consumer preferences—could greatly alter the growth of individual occupations. Unanticipated changes in technology which affect the way goods and services are produced could also alter growth. Detailed information about the assumptions used in these projections is presented in the November 1985 *Monthly Labor Review* and Bulletin 2253, cited above.

To make statements about the future course of U.S. economic activity, one must make judgments regarding the probable behavior of many factors that will affect the economy. While the preparation of projections may sound very precise and scientific when described, developing economic and employment projections is filled with uncertainty. The assumptions made by BLS cover a broad range, from those about which we may be reasonably certain to those which are not at all predictable. The role of BLS is to exercise its best judgment as to what would be a reasonable set of assumptions. But even if a particular assumption is highly uncertain, it may have little effect on the outcome of the projections because the most significant variables in the model may not depend closely upon—or be sensitive to—that assumption.

Methods. Beginning with population projections by age, sex, and race developed by the Bureau of the Census, a projection of the total labor force is derived using expected labor force participation rates for each population group. In developing participation rates, the Bureau takes into account a variety of factors that affect decisions to enter the labor force, such as school attendance, retirement practices, and family responsibilities.

The projection of the GNP level and the distribution of GNP by its major components (consumer expenditures, investment, government, and net exports) is carried out using a detailed macroeconomic model of the U.S. economy. Based on the projected labor force and on the various fiscal and monetary policy assumptions, a consistent distribution of real GNP by its major components and associated estimates of employment, output per workhour, and hours paid by major producing sectors are derived. The use of a macroeconomic model at this stage of the projections ensures a balanced and internally consistent representation of U.S. economic conditions over the projection horizon. Each of the major GNP components is in turn broken down by producing industry. Consumer expenditures, for example, are divided among industries producing goods and services such as housing, food, automobiles, medical care, and education.

Once estimates are developed for

these products and services, they are translated into detailed projections of industry output, not only for the industries producing the final product—such as an automobile—but also for the industries that provide electric power, transportation, component parts, and other inputs required in the production process. Input-output tables developed by the Department of Commerce and modified by BLS are used to estimate output.

By using estimates of future output per workhour based on studies of productivity and technological trends for each industry, industry employment projections are derived from the output estimates. In addition, many detailed industries are studied using regression analysis. In these studies, equations are developed that relate employment by industry to combinations of economic variables, such as population and income, that are considered determinants of long-run changes in employment. The industry employment projections developed through these studies are evaluated with data generated by the basic model to develop the final industry employment projections. They also are used to develop projections for industries that are not included in the basic model.

Occupational employment projections. The complex factors that affect employment growth for an occupation can be classified into two categories—those relating to growth of specific industries and those which affect the occupational structure of an industry. An occupation may grow as a result of expansion of the industries which employ these workers, or it may grow as a result of changes in the ways industries produce their goods or services. Because these factors interact, it is usually not possible to attribute an occupational employment change solely to one factor. Computer programmers, for example, are generally increasing as a proportion of employment in most industries—a change in the occupational structure—but an additional factor in their growth is the overall growth of the industries that are large employers of computer-related occupations.

The main causes of change in the occupational structure of industries are: (a) technological change, (b) changes in business practices and methods of operation, and (c) changes in product demand. Technological innovations may increase labor requirements for an occupation. For example, the growing use of computer technology is expected to increase the requirements for systems analysts and computer programmers; in nearly all industries, these workers are expected to account for an increasing share of total employment during the 1984–95 period. Technological change may also reduce requirements for an occupation. Requirements for typists, for example, are expected to be reduced because of the spreading use of word processing equipment, and the number of these workers is projected to decline as a proportion of employment in virtually all industries. Nevertheless, in many industries, employment of typists is expected to rise as the increase in total industry employment overrides the impact of technology.

In addition to technological innovations, changes in business practices and methods of operation affect the occupational structure of an industry. For example, the growing tendency of businesses to contract out building cleaning services will reduce the proportion of employment accounted for by janitors and cleaners in most industries. However, the negative effect of this trend on employment of janitors will be offset by significant employment gains in the building cleaning services industry.

Changes in the demand for the goods or services provided by an industry will also affect its occupational structure. For example, the educational services industry will have an increase in demand for elementary school teachers as the number of elementary school age children rises, but a decline in demand for college teachers as the number of college age students declines. Therefore, the occupational structure of the educational services industry in 1995 is projected to reflect a larger proportion of elementary school teachers than in 1984 and a smaller proportion of college teachers.

Projections of industry employment are translated into occupational employment projections using an industry-occupation matrix. The major source of occupational staffing patterns is the Bureau's Occupational Employment Statistics (OES) survey. The OES survey collects data from employers on the occupational distribution of workers in all nonagricultural industries, except private households. Each industry is surveyed every 3 years.

The occupational distribution of wage and salary workers in agriculture and private households, not covered by the OES survey, is derived from the Current Population Survey (CPS). Data on self-employed and unpaid family workers in each occupation also come from the CPS. Data from the matrix are available for 378 industries and over 500 occupations.

The occupational structure for each industry was projected to 1995 through analyses of the factors that are expected to change the structure. The projected structure was applied to the projected total industry employment derived from the Bureau's economic model, which captures expected changes in the structure of demand among industries, changes in labor requirements per unit of output, and other factors.

In some cases, employment is projected on the basis of its relationship to certain independent variables rather than on its representation in each industry. This approach is particularly useful when projecting employment for an occupation that is affected by a unique set of factors. For example, employment of elementary school teachers is projected based on trends in pupil-teacher ratios applied to projected school attendance. Projections that are developed independently are compared with those in the matrix and revised, if necessary, to assure consistency.

The Bureau has developed three sets of occupational projections—one for each of the scenarios of economic growth. The projected staffing patterns of industries used to translate industry employment into occupational employment are identical for all three, but growth rates for occupations differ among the three alternatives. Despite these differences, the basic changes in the occupational structure of the economy from 1984 to 1995 among the three alternatives are similar. Thus, although the *Handbook* focuses on the moderate scenario, the discussion would be very similar if either of the other scenarios were highlighted. However, differences in the occupational projections among the three alternatives should not be considered as the potential range within which projected 1995 employment will fall. The potential range is wider because most occupations are sensitive to a much wider variety of assumptions than those that were considered in the alternative models.

Replacement needs. Most discussions about future job opportunities focus on the employment growth in industries and occupations. Because faster growing industries and occupations generally offer better opportunities for employment and advancement, employment growth is an important gauge of job outlook. However, another element in the employment outlook for an occupation is replacement needs. Replacement openings occur as people leave occupations. Some individuals transfer to other occupations as a step up the career ladder or to change careers. Some stop working temporarily, perhaps to return to school or care for a family. And some leave the labor force permanently—retirees, for example. In most occupations, replacement needs provide more job openings than openings due to growth in an occupation.

A discussion of replacements, including separation rates for selected occupations, is presented in *Occupational Projections and Training Data, 1986 Edition*, BLS Bulletin 2251.

Appendix C. Sources of State and Local Job Outlook Information

State and local job market and career information is available from State employment security agencies and State Occupational Information Coordinating Committees (SOICC's). In general, State employment security agencies develop occupational employment projections and other local labor market information. SOICC's help people locate labor market and career information available within their State. Many SOICC's also provide a variety of occupational resource and career information. For each State, the District of Columbia, and Puerto Rico, the following list provides the title, address, and telephone number of the State employment security agency's director of research and the SOICC director.

Alabama

Chief, Research and Statistics Division, Department of Industrial Relations, Industrial Relations Building, Room 427, 649 Monroe Street, Montgomery, Ala. 36130. Phone: (205)261-5461.

Director, Alabama Occupational Information Coordinating Committee, Bell Building, Suite 400, 207 Montgomery Street, Montgomery, Ala. 36130. Phone: (205)261-2990.

Alaska

Chief, Research and Analysis Section, Alaska Department of Labor, P.O. Box 1149, Juneau, Alaska 99802. Phone: (907)465-4500.

Coordinator, Alaska Occupational Information Coordinating Committee, Alaska Department of Labor, P.O. Box 1149, Juneau, Alaska 99802. Phone: (907)465-4518.

Arizona

Research Administrator, Labor Market Information, Research and Analysis Section, Department of Economic Security, 733-A, P.O. Box 6123, Phoenix, Ariz. 85005. Phone: (602) 255-3616.

Executive Director, Arizona State Occupational Information Coordinating Committee, P.O. Box 6123, Site Code 897J, Phoenix, Ariz. 85005. Phone: (602)255-3680.

Arkansas

Chief, Research and Analysis Section, Employment Security Division, Arkansas Department of Labor, P.O. Box 2981, Little Rock, Ark. 77203. Phone: (501)371-1541.

Executive Director, Arkansas Occupational Information Coordinating Committee, Research and Analysis Section, Arkansas Employment Security Division, P.O. Box 2981, Little Rock, Ark. 72203. Phone: (501)371-3551.

California

Chief, Employment Data and Research Division, Employment Development Department, P.O. Box 1679, Sacramento, Calif. 95808. Phone: (916)427-4675.

Executive Director, California Occupational Information Coordinating Committee, 800 Capitol Mall, MIC-67, Sacramento, Calif. 95814. Phone: (916)323-6544.

Colorado

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Dictionary of Occupational Titles (D.O.T.) Index

The *Dictionary of Occupational Titles (D.O.T.)* was designed to provide detailed standardized occupational information to facilitate public employment service activities involving classification and placement of jobseekers. Its coding structure also is used to help bridge or relate to other occupational classification systems used in collection of employment data.

Columns 1 and 3 below list the numbers and titles, respectively, from the Fourth Edition of the *D.O.T.*, 1977, and its 1982 *Supplement*. Nearly all occupational statements in the *Handbook* list the *D.O.T.* codes that relate to or match the definitions used in the Bureau's Occupational Employment Statistics Survey—the major source of occupational staffing patterns used in the Occupational Outlook Program. However, the *D.O.T.* numbers associated with a few occupations—blue-collar worker supervisors, construction trades helpers, industrial machinery mechanics, manufacturers' sales workers, metalworking and plastic-working machine operators, precision assemblers, printing press operators, science technicians, and wholesale trade sales workers—are too numerous to list. These, nevertheless, are available on request from the Chief, Division of Occupational Outlook, Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C. 20212.

Numbers in column 2 refer to the coding structure of the 1980 *Standard Occupational Classification Manual (S.O.C.)*. The *S.O.C.* is the basis for the occupational arrangement used in the *National Industry-Occupation Employment Matrix*—the *Handbook's* source of data on current and projected employment.

D.O.T. Number	*SOC Code*	*D.O.T. Title*	*Page*
1061010	1500	Architect	55
1061018	1610	Landscape architect	55
1167010	1610	School-plant consultant	55
1261010	3720	Drafter, architectural	234
1261014	3720	Drafter, landscape	234
2061010	1622	Aerodynamist	63
2061014	1622	Aeronautical engineer	63
2061018	1622	Aeronautical test engineer	63
2061022	1622	Aeronautical-design engineer	63
2061026	1622	Aeronautical-research engineer	63
2061030	1622	Stress analyst	63
2151010	4210	Sales engineer, aeronautical products	257
2167010	1622	Cost-analysis engineer	63
2167014	1622	Field-service engineer	63
2167018	1622	Aeronautical project engineer	63
2261010	3720	Drafter, aeronautical	234
2280010	3719	Research mechanic	237
2281010	3719	Flight-test-data transcriber	237
3061010	1633	Electrical engineer	65
3061014	1633	Electrical test engineer	65
3061018	1633	Electrical-design engineer	65
3061022	1633	Electrical-prospecting engineer	65
3061026	1633	Electrical-research engineer	65
3061030	1633	Electronics engineer	65
3061034	1633	Electronics-design engineer	65
3061038	1633	Electronics-research engineer	65
3061042	1633	Electronics-test engineer	65
3061046	1633	Illuminating engineer	65
3061050	1633	Planning engineer, central office facilities	65
3161010	3711	Electrical technician	235
3161014	3711	Electronics technician	235
3161018	3711	Semiconductor-development technician	235
3167010	1633	Cable engineer, outside plant	65
3167014	1633	Distribution-field engineer	65
3167018	1633	Electrical engineeer, power system	65
3167022	1633	Electrolysis-and-corrosion-control engineer	65
3167026	1633	Engineer of system development	65
3167030	1633	Engineer-in-charge, studio operations	65
3167034	1633	Engineer-in-charge, transmitter	65
3167038	1633	Induction-coordination power engineer	65
3167042	1633	Outside-plant engineer	65
3167046	1633	Power-distribution engineer	65
3167050	1633	Power-transmission engineer	65
3167054	1633	Protection engineer	65
3167058	1633	Supervisor, microwave	65
3167062	1636	Systems engineer, electronic data processing	65
3167066	1633	Transmission-and-protection engineer	65
3187010	1633	Central-office equipment engineer	65
3187014	1633	Commercial engineer	65
3187018	1633	Customer-equipment engineer	65
3261010	3711	Instrumentation technician	235
3281010	3720	Drafter, electrical	234
3281014	3720	Drafter, electronic	234
3281018	3720	Drafter, electro-mechanical	234

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5061010	1628	Airport engineer	64
5061014	1628	Civil engineer	64
5061018	1628	Hydraulic engineer	64
5061022	1628	Irrigation engineer	64
5061026	1628	Railroad engineer	64
5061030	1628	Sanitary engineer	64
5061034	1628	Structural engineer	64
5061038	1628	Transportation engineer	64
5061042	1628	Waste-management engineer, radioactive materials	64
5167010	1628	Chief engineer, waterworks	64
5167014	1628	Drainage-design coordinator	64
5167018	1628	Forest engineer	64
5261010	3719	Engineering technician	237
5281010	3720	Drafter, civil	234
5281014	3720	Drafter, structural	234
6061010	1623	Ceramic design engineer	67
6061014	1623	Ceramic engineer	67
6061018	1623	Ceramic research engineer	67
6061022	1623	Ceramics test engineer	67
6261010	3719	Scientific glass blower	237
7061010	1635	Automotive engineer	66
7061014	1635	Mechanical engineer	66
7061018	1635	Mechanical-design engineer, facilities	66
7061022	1635	Mechanical-design engineer, products	66
7061026	1635	Tool designer	66
7061030	1635	Tool-designer apprentice	66
7061034	1635	Utilization engineer	66
7161010	3720	Die designer	234
7161014	3720	Die-designer apprentice	234
7161018	3720	Engineering assistant, mechanical equipment	234
7161022	1635	Mechanical research engineer	66
7161026	3713	Mechanical-engineering technician	237
7161030	3713	Optomechanical technician	237
7161034	1635	Test engineer, mechanical equipment	66
7161038	1635	Solar-energy-systems designer	66
7167010	1635	Die-drawing checker	237
7167014	1635	Plant engineer	66
7167018	3974	Tool programer, numerical control	250
7167022	1635	Tool-drawing, checker	237
7181010	3713	Heat-transfer technician	237
7261010	3720	Chief drafter	234
7261014	3720	Drafter, castings	234
7261018	3720	Drafter, patent	234
7261022	3720	Drafter, tool design	234
7267010	1635	Drawings checker, engineering	66
7281010	3720	Drafter, mechanical	234
8061010	1626	Absorption-and-adsorption engineer	63
8061014	1626	Chemical design engineer, processes	63
8061018	1626	Chemical engineer	63
8061022	1626	Chemical research engineer	63
8061026	1626	Chemical-test engineer	63
8061030	1626	Nuclear-decontamination research specialist	68
8167010	1626	Technical director, chemical plant	63
8261010	3719	Chemical-engineering technician	237
10061010	1625	Design engineer, mining-and-oilfield equipment	68
10061010	1625	Design engineer, mining-and-oilfield equipment	69
10061014	1624	Mining engineer	68
10061018	1625	Petroleum engineer	69
10061022	1624	Research engineer, mining-and-oil-well equipment	68
10061022	1624	Research engineer, mining-and-oil-well equipment	69
10061026	1624	Safety engineer, mines	68
10061030	1624	Test engineer, mining-and-oilfield equipment	68
10061030	1624	Test engineer, mining-and-oilfield equipment	69
10161010	1625	Chief engineer, research	69
10161014	1625	Chief petroleum engineer	69
10167010	1625	Chief engineer	69
10167014	1625	District supervisor, mud-analysis well logging	69
10167018	1625	Superintendent, oil-well services	69
10261010	3719	Field engineer, specialist	237
10261026	3719	Test-engine evaluator	237
10281010	3720	Drafter, directional survey	234
10281014	3720	Drafter, geological	234
10281018	3720	Drafter, geophysical	234
11061010	1623	Foundry metallurgist	67
11061014	1623	Metallographer	67
11061018	1623	Metallurgist, extractive	67
11061022	1623	Metallurgist, physical	67
11061026	1623	Welding engineer	67
11161010	1623	Supervisor, metallurgical-and-quality-control-test	67
11261010	3719	Metallurgical technician	237
11261014	3719	Welding technician	237
11261018	3990	Nondestructive tester	67
11281010	3719	Laboratory assistant, metallurgical	237
11281014	3719	Spectroscopist	237
11361010	3719	Tester	237
12061018	1634	Standards engineer	65
12067010	1634	Metrologist	65
12167010	1634	Configuration management analyst	65
12167014	1634	Director, quality control	65
12167018	1634	Factory lay-out engineer	65
12167030	1634	Industrial engineer	65
12167038	1634	Liaison worker, tool fabrication	65
12167042	1634	Manufacturing engineer	65
12167046	1634	Production engineer	65
12167050	1634	Production planner	65
12167054	1634	Quality-control engineer	65
12167062	1634	Supervisor, vendor quality	65
12167066	1712	Systems analyst, electronic data processing	74
12167070	1634	Time-study engineer	65
12167074	1634	Tool planner	65

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2187010	1634	Material scheduler	65
2187014	1634	Shoe-lay-out-planner	65
2261014	3890	Quality-control technician	237
2267010	3712	Industrial engineering technician	237
3161010	3719	Agricultural-engineering technician	237
4281010	3720	Drafter, marine	234
15061010	1627	Design engineer, nuclear equipment	68
15061014	1627	Nuclear engineer	68
15061018	1627	Research engineer, nuclear equipment	68
15061022	1627	Test engineer, nuclear equipment	68
15061026	1627	Nuclear-fuels reclamation engineer	68
15061030	1627	Nuclear-fuels research engineer	68
15067010	1627	Nuclear-criticality safety engineer	68
15137010	1627	Radiation-protection engineer	68
15167010	1627	Nuclear-plant technical advisor	68
15167014	1627	Nuclear-test-reactor program coordinator	68
17161010	3720	Drafter, chief, design	234
17261010	3720	Auto-design checker	237
17261014	3720	Design drafter, electromechanisms	234
17261018	3720	Detailer	234
17261022	3720	Detailer, furniture	234
17261026	3720	Drafter, commercial	234
17261030	3720	Drafter, detail	234
17261034	3720	Drafter, heating and ventilating	234
17261038	3720	Drafter, plumbing	234
17261042	3720	Drafter, computer-assisted	234
17281010	3720	Auto-design detailer	234
17281014	3720	Drafter apprentice	234
17281018	3720	Drafter, assistant	234
17281022	3720	Drafter, automotive design	234
17281026	3720	Drafter, automotive design layout	234
17281030	3720	Drafter, oil and gas	234
17281034	3720	Technical illustrator	234
18167010	3733	Chief of party	57
18167014	3739	Geodetic computer	57
18167018	1643	Land surveyor	57
18167026	1649	Photogrammetric engineer	57
18167034	3733	Surveyor assistant, instruments	57
18167038	1649	Surveyor, geodetic	57
18167042	1649	Surveyor, geophysical prospecting	57
18167046	1649	Surveyor, marine	57
18167050	1649	Surveyor, mine	57
18261018	3734	Editor, map	57
18261022	3734	Mosaicist	57
18261026	3739	Photogrammetrist	57
18262010	1644	Field-map editor	57
19061014	1623	Materials engineer	67
19161010	1639	Supervisor, estimator and drafter	234
19161014	3719	Test technician	237
19167018	1628	Resource-recovery engineer	64
19261014	3720	Estimator and drafter	234
19261022	3890	Test technician	237
19267010	3719	Specification writer	237
19281010	3711	Calibration laboratory technician	235
19381010	3890	Laboratory technician	237
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10 Musicians

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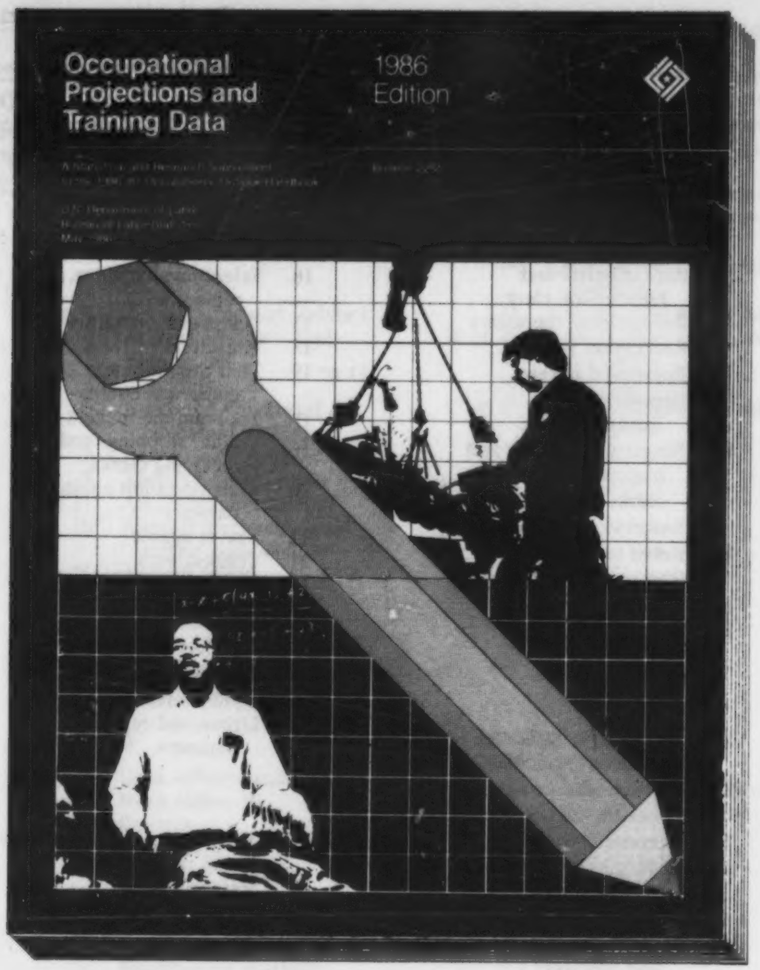

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